

SCIENCE

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A REMARKABLE ELECTRIC-LIGHT PLANT.

THE Heisler plant operated by the Illinois Valley Electric Light and Power Company is one of the most remarkable incandescent electric-light plants in the world. We illustrate some of its prominent features. The location and arrangement of this plant, so characteristic of the Heisler system, deserve more than ordinary notice. The area covered by one circuit has never been equalled in the history of incandescent lighting. Their circuit of forty-five

The Illinois Valley Electric Light and Power Company, was organized at Ottawa, Ill., in the spring of 1889. Desiring their operating expenses to be a minimum, they looked around for a suitable location. They were fully impressed with the advantages of water-power, and found an excellent site at Marseilles, eight miles distant. The advantages of the incandescent light were such as to lead the projectors of the enterprise to favor its adoption, but some investigation into the cost of the circuits required by some systems revealed the fact that the investment for copper

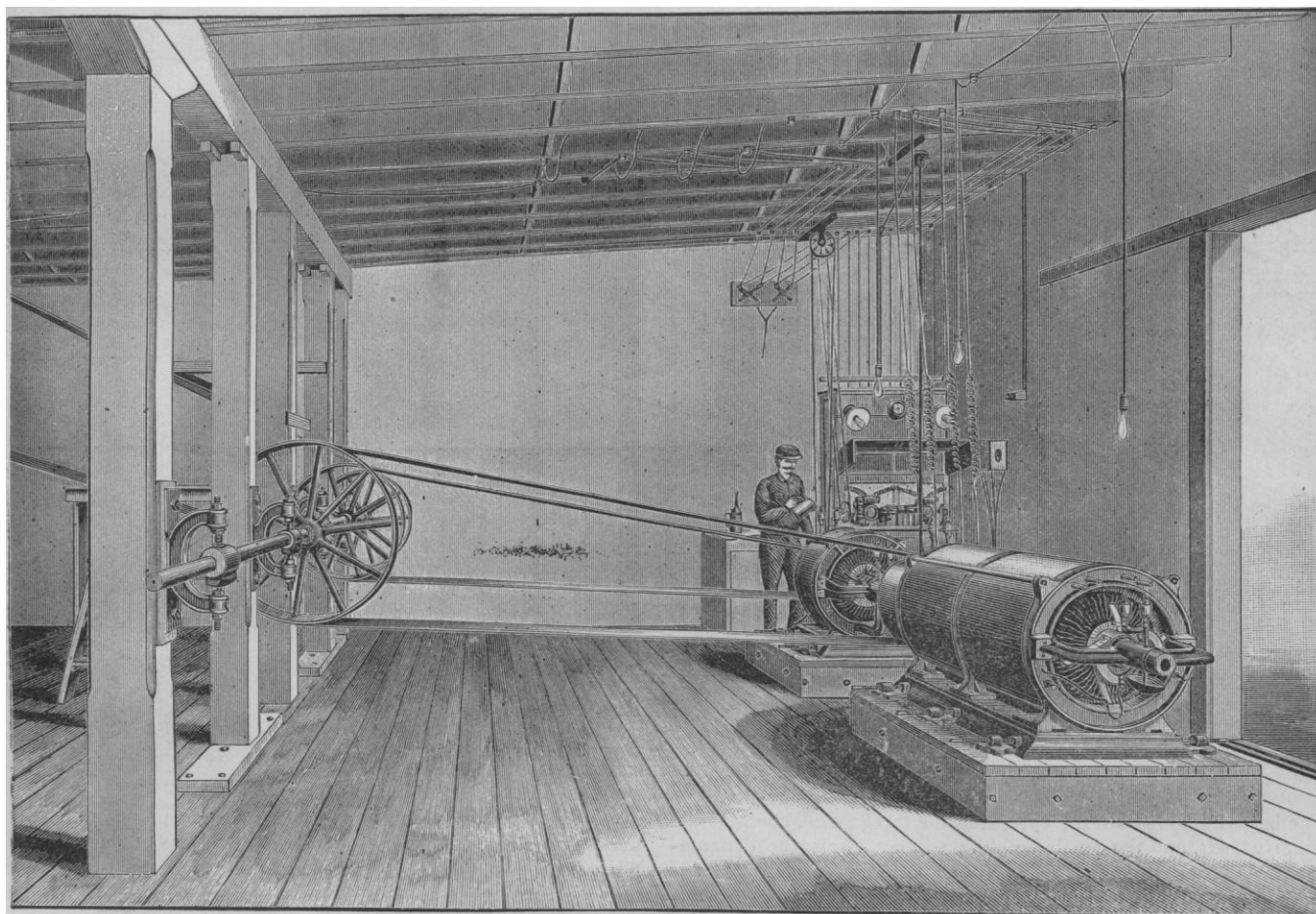


FIG. 1.—INSIDE VIEW OF THE HEISLER DYNAMO-ROOM, MARSEILLES, ILL.

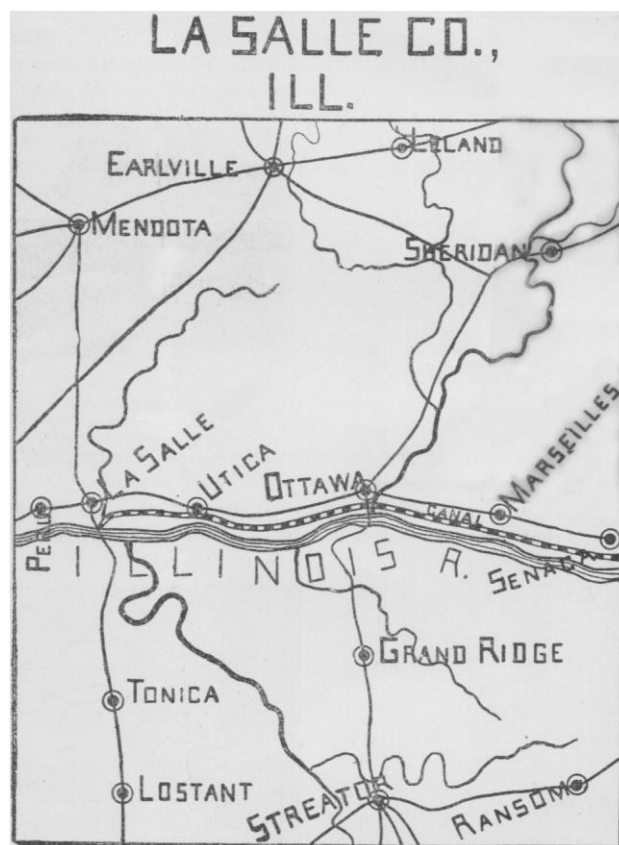
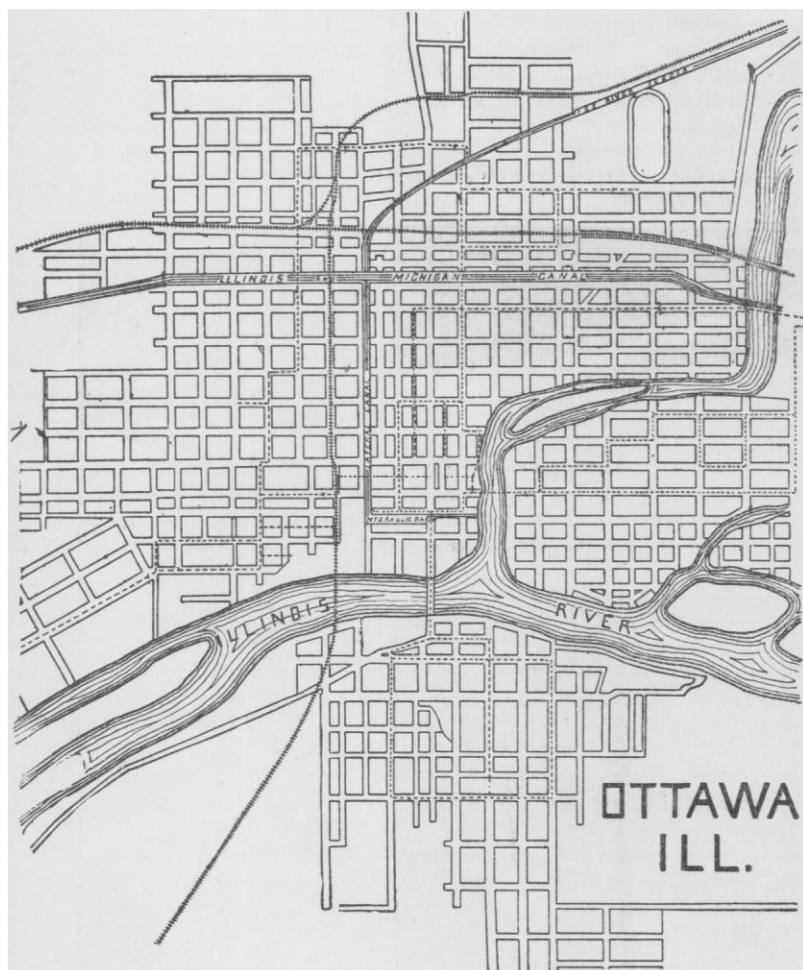
miles is, so far as we have been able to learn, the longest incandescent circuit in the world, nor do we know of a longer arc circuit. Not only is this the case, but the investment in copper for the circuits is a very small part of the total cost of the installation. Another fact characteristic of this system is that the most distant lights burn fully as brightly as those near the dynamos. The results have been eminently satisfactory, both to the parties using the light, and the citizens who inaugurated the enterprise, and carried it through to success.

would be prohibitive. Although somewhat discouraged by this view of the matter, they did not cease their investigations. Hearing of the claims made regarding the adaptability of the Heisler system of St. Louis for such locations, they were induced to look into its merits. The investigation resulted in the adoption of the system, and the installation of an extensive plant at Marseilles. The lights were started in the summer of 1889, and have been successful from the beginning. Arrangements are now being perfected to extend the circuits from Marseilles to Seneca, located five

miles distant in the opposite direction from Ottawa. The capacity of the original apparatus is now almost fully taken up, and enlargements are necessary.

From the accompanying engravings an excellent idea may be secured of the peculiar features of the plant mentioned. The outline map of La Salle County (Fig. 3) shows the relative location of the cities of Ottawa, Marseilles, and Seneca, also the Illinois River, and the Illinois and Michigan Canal. It will be seen that the lighting done by this plant extends for a distance of thirteen miles along the Illinois River, from the centre to the border of La Salle County. Fig. 2 is an outline map of the city of Ottawa. The incandescent circuits are indicated by dotted lines, and can be seen entering the city from the east, on the right of the engraving. This circuit is constructed throughout of No. 8 wire, hard drawn and weather-proof. Fig. 4 is a view of the company's buildings.

that are imported from Singapore. Many persons who have an objection to tinned foods generally, have pronounced these to be of excellent quality and flavor, and though they are to be obtained almost at any grocer's, and at a very cheap rate, they are not in such great demand as might be expected. The prejudice against new products or preparations is difficult to overcome, and this prejudice is more general even among the poorer and working classes than among those better informed. There is a general belief among them, says the *Journal of the Society of Arts*, London, that only the commoner qualities of food-products are put up into tins, and consequently they reject them. The success of the pineapple, however, treated thus, ought to dispel that notion, and to lead to other fruits, especially those of tropical countries, to be similarly treated for export purposes. There seems to be no reason why mangoes, guavas, rose-apples, and a host of others, should



FIGS. 2 AND 3.—MAPS OF OTTAWA, ILL., AND OF LA SALLE COUNTY, ILL.

The large building with the cupola, in the foreground, contains the water-wheels, and the small building to the left is the dynamo-room. This engraving also shows the flume as it enters the building, and the circuits leaving the station. Fig. 1 is an inside view of the dynamo-room, showing the machines in position, together with the shafting, pulleys, and belting by which the dynamos are driven. The engraving also shows the method of connection between the dynamo and automatic regulator. On the whole, this station may be ranked as being highly typical of modern progress in incandescent electric-lighting.

CONDENSED FRUITS AND VEGETABLES.

THE introduction of preserved or condensed foods, both of animal and vegetable origin, in hermetically sealed tins, has developed to an enormous extent of late years. One of the most successful of the recent introductions is undoubtedly the pine-apples

not become regular articles of import and consumption, and even perhaps some of the other vegetable productions of distant lands. That the ordinary English vegetables and fruits can be preserved for winter use when the fresh ones are not obtainable has been proved over and over again.

The preservation of vegetables and herbs by desiccation by the natural action of the sun has been known to and practised by agriculturists from time immemorial. Within historical times it has been supplemented and improved upon by the introduction of drying in kilns. Both the ancient Chinese and Egyptians used this method in remote ages. The vegetable substances offered great difficulty for stowage and transport in consequence of their bulk, and the imperfect nature of their preservation. This difficulty was very successfully overcome in 1846 by a Mr. Masson, who was head gardener to Louis Philippe, King of the French, and who invented a process by which kiln-dried vegetables, herbs, and fruits can be compressed by powerful hydraulic pressure, re-

taining their hygienic properties for a length of time. By this process a quantity of vegetables sufficient for a mess of forty thousand persons was reduced to the volume of one cubic metre, thus effecting an enormous saving in stowage and in transport.

very largely used, and were mixed, dried, and compressed under certain rules laid down by an international Anglo-French military and naval medical commission, to which the celebrated Alexis Soyer, who was chief inspector of army cookery to the campaign,

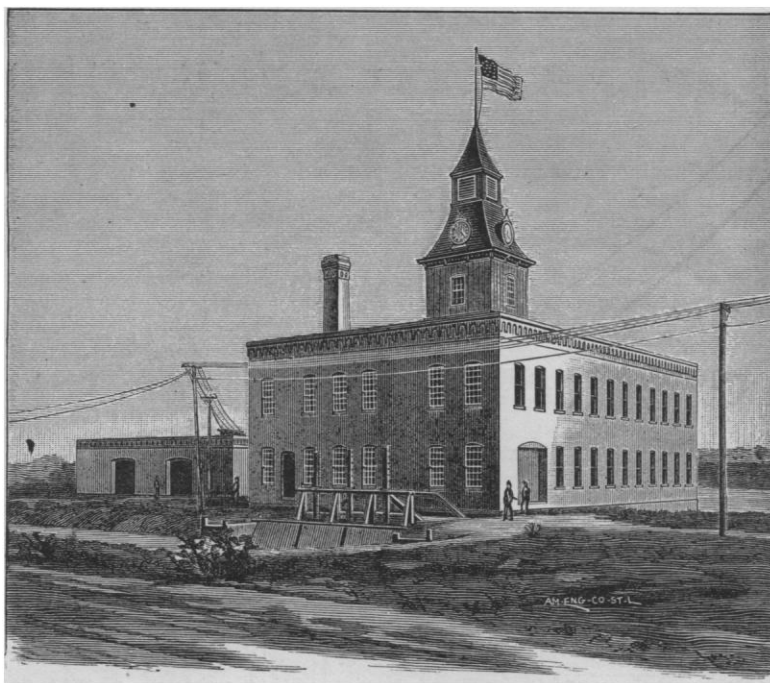


FIG. 4.—HEISLER COMPANY'S BUILDINGS AT MARSEILLES, ILL.

Later on, the invention was patented by Messrs. Chollett & Co. of Paris and London, who introduced improvements, and have ultimately brought the process to its present state of perfection; so that their successors, Messrs. C. Prevet & Co., prepare enormous

quantities of dried and compressed vegetables and fruits for the supply of the British army and navy, the Board of Trade making it compulsory that every outgoing vessel is supplied with a certain quantity.

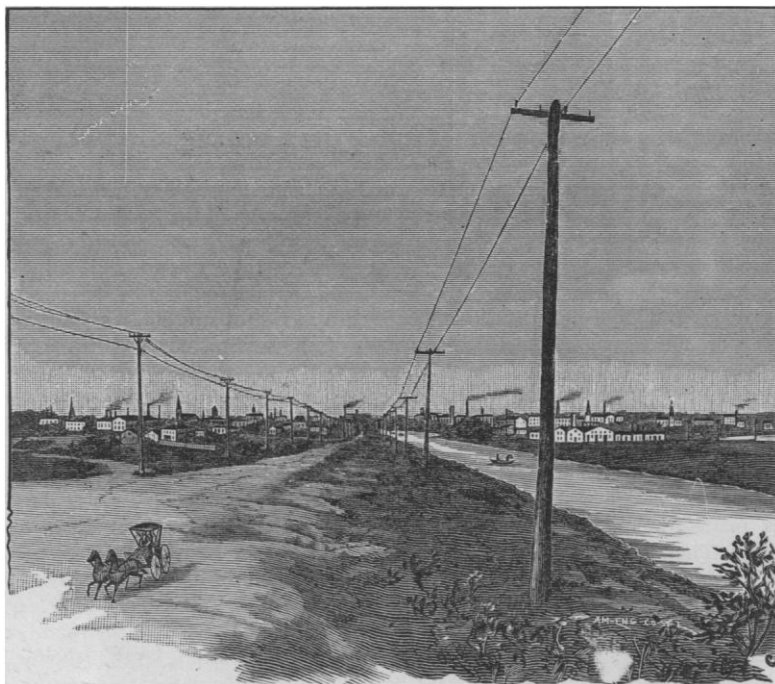


FIG. 5.—HEISLER COMPANY'S POLE LINE.

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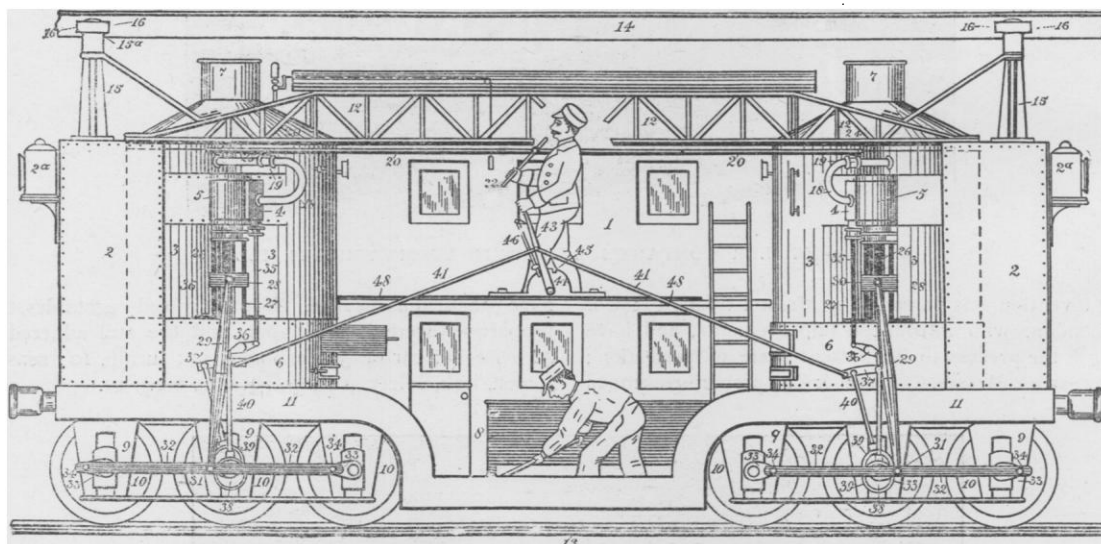
At the time of the Crimean war these prepared vegetables were

The vegetables are gathered in the autumn, when they are in their prime, and carefully sorted, then cleaned, washed, peeled, sliced, and slightly steamed (fixing the saccharine and albuminous parts, preventing to a great extent the volatilization of the essential oils, and thus preserving their hygienic and antiscorbutic proper-

ties). The various manipulations were formerly performed by hand, but all are now done by machinery. The vegetables thus prepared are then dried in kilns and on lattice work trays by currents of moderately hot, dry air, thereby retaining their natural color, flavor, and aroma. This stage of the process requires the greatest care and attention, so as to keep the temperature constantly at the level ascertained by experience to be necessary for each kind of vegetable. The vegetables and herbs are then carefully mixed in the proportions given above, and then compressed to one-eighth of their original bulk (when fresh) by powerful hydraulic pressure into moulds, thus forming square slabs about three-quarters of an inch thick, grooved so as to be divided into cakes of five rations each, at the rate of one ounce per ration, easily separated for convenience of issue. These slabs are then wrapped in paper, and packed by machinery into square tins, which are hermetically soldered. Before the lid is soldered down, a punch stamps it automatically from the inside with the season of manufacture. When two years appear on this stamp, as "1888-89," the first is the year of the crop, and the second the year of compression. The tins are now made of bright "coke" tin-plate of the best quality, it having been found by experience that the vegetables keep much better in this material than in the dull terne-plate formerly used.

THE BOYNTON BICYCLE RAILROAD.

IN last week's issue we briefly described the Boynton Bicycle Railroad at Gravesend, between Bay Ridge and Coney Island, a few miles from this city. The novelty of the Boynton system, and its vast possibilities in the line of high speed combined with safety, which rest on the fact of its running, like the bicycle, on one rail, justify us in giving our readers some further particulars concerning it. Among the advantages inherent in this system (in which the train is like a wide plank on edge), the development of which is only a question of the proper adaptation of means to ends, are the following, as given by a competent and disinterested authority on engineering: 1. A great increase in smoothness of motion at high speeds, permitting an almost indefinite increase of speed without danger in this respect; 2. A diminished air resistance, due to the narrower vehicles and running-gear; 3. A narrower road-bed, less costly to construct and to maintain. To these may be added the much greater ease, smoothness, and safety in rounding curves at high speed, as well as the excellent facilities for electrical propulsion afforded by the guard-rail overhead. Another advantage, the great flexibility of the system, must not be neglected. It is as well adapted to the slower and heavier freight traffic as to the light and rapid passenger service; to the high speed



FREIGHT LOCOMOTIVE FOR THE BOYNTON BICYCLE RAILWAY.

The vegetables and herbs are also prepared separately, as there is a greater demand in some quarters for some kinds than for others: as, for instance, in South Africa, for compressed celery as a cure, when stewed, for rheumatism caused by sleeping on the open veldt; in India, for compressed onions, to make a soup considered a sovereign remedy for the effects of over-indulgence in spirituous liquors; in the Hudson Bay territory, for the same article as a generator of warmth in the stomach; and in Burmah, for compressed apples and pears, which are prepared in a similar manner to the vegetables and herbs. All these vegetables, herbs, and fruits are also obtainable in their dried and desiccated condition, without being compressed into cakes. In either state they are extremely convenient, portable, and useful, as are also the prepared and condensed soups and flours made from potato, pea, lentil, haricot bean, carrot, chestnut, etc. They are, moreover, wholesome; and the use of these vegetables, fruits, etc., will probably become more widely extended.

The Engineering and Building Record appeared in a colored cover last week, and is enlarged by the four pages which the cover made. The improvement has been under consideration for a considerable time, and, as the current volume closes with the last issue for November, it seemed best to make it now. The getting of a cover which should at once be distinctive in color and meet all the other requirements was no easy task, and the reader is left to judge of the result finally reached.

and frequent stoppages of city and suburban rapid-transit trains as to the long runs of the limited express on trunk-lines; to electrical as to steam propulsion; and to elevated or underground as to surface roads. Its development in all these directions must follow as a necessary consequence to its successful introduction in any one of them. For this reason the progress made in perfecting the details of the system, at the Gravesend road and elsewhere, will be watched with unusual interest by the intelligent people of every country in which railroads have been introduced.

The section of road at Gravesend upon which the Boynton system is used had long been abandoned by the company formerly operating it, as they had secured a more direct route with fewer heavy grades. It was in poor condition, owing to the decay consequent on long disuse; but as in some respects at least (such, for instance, as high grades and several sharp curves) it was well adapted for showing the merits of this system, it was secured by the Boynton Company. They equipped it with an overhead guard-rail, and are getting the road-bed and track into good repair as speedily as possible, so that they will soon be able to double the speed of the trains without danger of accident from defective ties, etc. Even in its present state, with the train-speed limited by unfavorable conditions to a fraction of that possible under more favorable circumstances, this short railroad is attracting a great deal of attention, not only from railroad men, but also from men eminent in engineering, electrical, and scientific circles generally.

On Saturday of last week a representative of this paper was

present at an experimental trip over the road, made to test the results of some repairs to the track and road-bed, as well as to give an idea of the workings of the system to a party of gentlemen interested in railroad matters, among whom were a few from Europe. The run over the road was fully up to the expectations of all present, the train gliding along as smoothly, and as free from jar or oscillation, at the highest speed reached as at the slowest. Even when rounding curves of short radius at high speed, where cars are subject to the violent and disagreeable oscillations caused by the difference in level of the rails combined with the centrifugal force due to the swing around the curve, the Boynton car, on its one-rail track, ran as smoothly and steadily as on a tangent. In fact, the only thing to indicate that the car, when rounding a curve, was not running on a straight stretch of track, was the slight incline given the car by the guide-rail overhead to counteract the centrifugal force caused by the rapid motion and curvilinear course of the train. Inequalities in the track also, which make themselves manifest by oscillations in ordinary railroad travelling, merely caused a slight vertical motion of the car, softened, of course, by the springs. To sum up the impressions produced by a ride over the road, every thing seems to indicate that Mr. Boynton's theories are based on correct scientific principles, that his system solves the problem of high speed combined with safety, and that for a continuous speed greater than fifty miles, reaching perhaps a hundred or more, — a speed urgently demanded by present business methods as a natural sequence to telegraphic and telephonic development, — Mr. Boynton's system, or some modification of it, must necessarily be adopted.

Our illustration shows a freight-engine of a type designed by Mr. Boynton for the bicycle or single-rail system of railroad. Though presenting many novel features, being intended for great hauling power rather than high speed, it embodies the same general principles as the high-speed locomotive illustrated and described in our issue of last week. It carries two boilers, two cylinders, and two sets of drivers. The two-story cab is located midway between the boilers, so that one engineer and one fireman control both parts of the engine.

THE KONGO RAILWAY.¹

IN November, 1885, a syndicate of English capitalists, headed by Sir William Mackinnon, was constituted with a view of obtaining from the Kongo State the concession of the railway from the Lower Kongo to the Stanley Pool. The time, however, had not yet come for great enterprises on the Kongo. Stability was not yet sufficiently secured. The political work was not sufficiently advanced; so that capital, in order to insure its security, was obliged to demand powers which the Kongo was unable to grant, so that the negotiations fell through, and the English syndicate was dissolved.

Shortly afterwards the affair was taken in hand, at my suggestion, on a more modest scale, by the *Compagnie du Congo pour le Commerce et l'Industrie*, constituted with a capital of 1,000,000 francs, which sum was afterwards raised to 1,225,000 francs, with the immediate object of studying in a practical and definitive fashion the possibility of laying the railway. The statutes were drawn up, however, in order to allow the *Compagnie* to become, by simply increasing its capital, the company for laying and working the railway. The *Compagnie du Congo* was definitely constituted on the 9th of February, 1887. By the 8th of the following month of May, the first expedition of engineers left for the Kongo. On the 10th of June a second group sailed from Antwerp. At the end of July the gangs, assembled at Matadi, were composed of one director of survey, twelve engineers, and one physician. Those who had arrived first determined the geographical position of Matadi, made some soundings to satisfy themselves of vessels of a large draught being able to land without considerable works, and reconnoitred the environs. From the first days of August, work began. One study-gang walked in advance, reconnoitring the country, and determining rapidly, by means of the levelling-compass, the zone of

the ground to be surveyed. Three gangs, each composed of three engineers, followed, and drew with the tacheometer the plan of the reconnoitred zone. Haussas, negroes of the Gold Coast, were employed as staff-holders. The zone on which the operations with the tacheometer were performed varied, according to circumstances, from 50 to 200 metres on both sides of the likely axis of the way. The progress of the work, which at the very beginning of the operations was only from 300 to 500 hundred metres per brigade and per day, on the difficult ground near Matadi and Palaballa, soon increased to one or two kilometres, the expedition having passed the mountainous region, and by way of exception was raised to four or five kilometres per day, the maximum space between the stations of the instrument being 300 metres. The operations on the ground continued in 1887 up to December, when the study had been carried on as far as Lukunga. The work then suffered an interruption of four months on account of the rainy season; nevertheless a special gang continued working during January and February, 1888, in order to execute near Matadi the survey of an alteration made in that region to the first direction-line. In May, 1888, the staff having again their full complement, works were resumed. While the chiefs of the gangs went to reconnoitre previously the region which extends between the Lukunga and the Stanley Pool, the other engineers completed the works around Matadi. At the beginning of July the whole staff resumed the operations with the tacheometer. On the 4th of November, 1888, the level was set up for the last time at Stanley Pool, and the engineers went back to Europe.

The railway which is proposed to be laid in the cataract region, according to the survey plans and estimates, will have a gauge of 75 centimetres, with steel rails weighing 23 kilos, steel sleepers at equal distances of 80 centimetres, and weighing 23 kilos, the whole of the line weighing 75 tons per kilometre. The total length of the line will be 435 kilometres. The laying of the first 26 kilometres only will offer some important difficulties, while the remainder of the line will be laid under exceptionally easy circumstances, either in plains by straight lines, or along the hillsides by means of curves of great radius. The earthworks of the first 26 kilometres not only will be much more considerable, but a great deal of it will have to be done by excavating the rock; while farther the cuttings can be proceeded with in argillaceous ground, and nearly always in sandy and friable earth.

If we except the first part, there will be few constructive works, the most important of them being a bridge of 100 metres across the Inkissi, two bridges of 80 metres across the Mpozo and the Kwillu, and six bridges ranging between 40 and 60 metres. The others will have a length of from 5 to 20 metres only in the clear. The construction of the abutments of bridges will be everywhere very easy, as firm soil is to be met with at no great depth from the surface of the ground. Nearly everywhere, except on the first section, the nature of the soil will admit of bricks being made; and in the valleys of the Luima, of the Unionzo, Kwillu, and Inkissi, limestone is to be found in abundance. Fragments of quartzite and sand, everywhere to be met with, will supply the ballast.

The maximum of incline will be 46 millimetres per metre, and will be reached three times during the first portion, where, as a rule, steep inclines will be met with. Nevertheless it has been possible to combine the slopes and horizontals so as to render traction as easy as possible, and during the last 400 kilometres the slopes and inclines are very infrequent and generally insignificant. Likewise, in the first section, curves are rather numerous and of short radius, although the latter will never be less than 50 metres. Thus all the difficulties of laying and working accumulate at the starting-point, — a most fortunate circumstance, as the first section also offers greater facilities for laying; and, on the other hand, by establishing a twofold traction for the first 26 kilometres, and, reorganizing the trains beyond Palaballa, it will be possible to work the whole of the line under far greater economical conditions than if the working difficulties had to be dealt with at some distance from the starting-point.

The locomotives, when loaded, will weigh 30 tons, and drag, with the speed of 18 kilometres per hour, an average useful load of 50 tons.

The starting-point of the railway on the Lower Kongo will be

¹ Paper read before the Geographical Section of the British Association by Capt. Thys.

at Matadi, — a point which is easily reached by sea-going steamers, and where inexpensive works will easily enable those steamers to unload their cargoes on wagons. The terminus of the railway at the Stanley Pool will be at Ndolo, at a little distance above Kinchassa, and also above all the rapids which hinder navigation in the cataract region. Beyond this point light-draught vessels can ascend the Kongo and its affluents for an uninterrupted length of 11,500 kilometres. Ndolo is admirably situated for the building of spacious quays.

Matadi and Ndolo will be the two principal stations. A second-class station will be erected in the district of Kimpésé, where travellers will stop, as two days will be required to pass the distance between Matadi and Stanley Pool. The trains will not run by night. Three other stations will be established along the line, — one at the Lufu, another at the Inkissi, and a third at Ntampa, — thus dividing the total distance between the Lower Kongo and the Stanley Pool into five sections of an average length of 85 kilometres each; each section being itself divided into four sub-sections by three halting-places, with water-tank and crossing-way.

To sum up, the general estimate of the scheme demands a capital of 25,000,000 francs, which will be sufficient to build the road, purchase the rolling stock, cover the general expenses both in Europe and Africa, and meanwhile pay the interest on capital during the construction of the railway, which, according to estimate, will occupy four years.

The figure of 60,000 francs, or more exactly 58,500 francs per kilometre, for the Kongo Railroad, is a maximum price, which has only been reached, on the one hand, because the construction really does, on one portion of the track, involve some difficulties; on the other hand, because the highest valuation has been adopted. When we look to the matter closely, we must even admit that the price we have named is a high one; for, as a matter of fact, the Kongo Railway is an exceptionally easy undertaking. The laying-out of its course was only influenced by purely topographical considerations; and the surveyors had no troublesome allowances to make for connecting the road with any particular establishment for industrial, commercial, or even political purposes. There were no lands to purchase, besides which (and this is an important item, to which I call your full attention) there are and there will be no side profits to be allowed for. The undertaking is, and will remain, completely independent from speculation; the cost of the railway, such as we give it, being strictly that established by the estimates.

Furthermore, the proposed railway is not a wide-gauge railway, but a narrow-gauge railway, adapting itself to all the variations of the ground it will travel over, and exactly befitting the commercial position of a country yet in its infancy. I remember the graphic words used by one of my colleagues on the Board of the *Compagnie du Commerce et l'Industrie* while we were discussing the width of the road, and I will repeat it to you. "What we want," he said (and we all agreed with him), "is a good and substantial iron track, where locomotives and wagons may be set rolling."

The transport-power of the Kongo Railway, with its seventy-five centimetres gauge, between "bourrelets," will meet all present requirements, and will meet them for a large number of years to come.

The construction of the Kongo Railway will be proceeded with by the *Compagnie du Chemin de Fer du Congo*, commanding a registered capital of £1,000,000 sterling, of which one-fifth has been subscribed by English capitalists, thanks to the spirited enterprise and the great authority of Sir William Mackinnon.

Thanks to the disinterested intervention of the Belgian Government, who have subscribed £400,000 worth of shares which will never bear more than $3\frac{1}{2}$ per cent interest, and who forfeit all excess of profit in favor of the other shares, it will only require, in order that the ordinary capital invested in the undertaking may reap a return of 8 per cent, that our receipts shall reach 3,000,000 francs, — an amount which, according to the terms laid down by the contract for the early period of the undertaking, will certainly be realized if the up traffic reaches 2,250 tons, if passenger traffic reaches the total figure of 300 up and down passengers, and if the railway in its down journey carries 200 tons of ivory, 600 tons of gutta-percha, and 3,000 tons of miscellaneous goods, paying only

100 francs for carriage. These figures will undoubtedly be reached from the beginning. Even at the present time, 1,800 tons are carried up the Kongo. We only, therefore, provide for an increase of 450 tons within four years. The 200 tons of ivory above mentioned merely represent what is actually conveyed by native carriers. As to the 600 tons of gutta-percha, one single branch of the *Compagnie du Haut Congo* — the Luébo branch — is in a position to purchase 240 tons per annum; and the 300 remaining tons will be provided by palm-oil, gums, wood for building-purposes, etc.

The opportunities afforded to communication by the 11,500 kilometres of practicable waterway of the Upper Kongo and its tributaries will, indeed, enable us to drain towards the Stanley Pool, for carriage by the railway, the various exchangeable commodities which the immense territories of the Upper Kongo abundantly produce.

HEALTH MATTERS.

A Physiological Study of Absinthe.

As commonly met with, absinthe only contains about thirty minims of essence of absinthe to the litre, the remainder consisting of alcohol, together with from sixteen to a hundred drops each of the essence of anise-seed and star anise-seed, coriander, fennel, peppermint, angelica, hyssop, and mélisse; and the color is given by fresh parsley or nettles. Cadiac and Meunier, as reported in *The Medical Analectic*, recently undertook to investigate the action of the various components of the liqueur, in order to ascertain to which of them its peculiarly intoxicating effects were due. They found that hyssop induces epileptiform attacks in ten-grain doses, while fennel induces visual troubles and languor. Poisonous doses of coriander give rise to sudden anæsthesia and muscular convulsions. Mélisse determines a passing stimulation, followed by lassitude and sleepiness. Both varieties of anise-seed possess powerfully stimulating properties, with consecutive visual troubles, muscular inco-ordination, and dulness of sensation, with abrogation of the will and heavy sleep.

Although not, strictly speaking, poisonous, anise-seed is a violent excitant of the nerve-centres, even in the relatively small quantities contained in the usual allowance of the liqueur. If the dose be increased, epileptiform attacks are induced. A litre of ordinary absinthe only contains about thirty drops of the essence, — a dose which, if taken all at once, only gives rise to powerful mental stimulation, increasing the appetite and facilitating digestion. Moreover, it leaves behind it neither depression nor somnolence. The sum total of the effects of the blend is a sensation of comfort and physical and mental activity, followed by lassitude and indisposition to exertion, and, in large doses, to epileptiform attacks. The authors are disposed to attribute the major part of the injurious effects to the collateral essences, and seriously recommend manufacturers to discard the use of several of these, and of anise-seed in particular.

THE NATIVE EGYPTIAN AS A SUBJECT FOR SURGICAL OPERATION. — The native Egyptian is an extremely good subject for surgical operation. Clot Bey, the founder of modern medicine in Egypt, has it that "it requires as much surgery to kill one Egyptian as seven Europeans. In the native hospitals, the man whose thigh has been amputated at two o'clock is sitting up and lively at six." Shock is almost entirely unknown, and dread of an impending operation quite an exception. In explanation may be noted the resignation inculcated by their religion; the very small proportion of meat in, and the total absence of alcohol from, their diet; and in general their regular, abstemious, out-of-door life.

THE DISEASED-MEAT SCARE. — The *Medical Record* comments editorially on Dr. Behrend's article, which has excited much talk and learned editorial writing in the daily press. It says, "But it is yet entirely unproved that the meat of tuberculous cattle ever caused tuberculosis in man. Bovine tuberculosis is generally pulmonary. Tuberculous bacilli are found sometimes in the glands, but practically never in blood or muscle, except in acute general infection. Even if the bacilli do get in meat-muscle, Nocard, who is an ingenious and skilful bacteriologist, has shown that they are destroyed or digested in the tissue. And Nocard has positively

affirmed that one can safely eat the flesh of tuberculous animals the tubercles of which are limited to the viscera and lymphatics. High temperatures destroy the bacillus also, and therefore thorough cooking would make even tuberculous tissue safe. Dr. Behrend ought to know, also, that tuberculous meat can only infect the body through the alimentary tract; but Koch has shown that adult bacilli are destroyed in the stomach, and that the spore bacilli can only get through alive by a narrow margin. But, furthermore, if tuberculous meat were so dangerous, there should be more primary intestinal tuberculosis. In adults this disease is a great rarity, and practically it may be ignored. Even including infants, it does not make up ten per cent of tubercular diseases. We venture to say, therefore, that the 375,000 Londoners who possibly ate the presumably tuberculous meat digested it and its bacillus, and were the better for their repast. It must be very evident, we think, that the danger to adults from eating flesh of tuberculous cattle is so extraordinarily remote that it may be practically ignored. The liver, "lights," and glands of such cattle, however, are perhaps not so safe, and sausage made up from meat seriously affected may not be free from danger. We advise, therefore, as we have done, the governmental inspection of slaughter-houses; but we much more seriously urge the supervision of milk. This, it is known, can carry the tuberculous virus, and, being consumed uncooked by delicate and growing children, is a far more dangerous product than the flesh of tuberculous cattle."

SAWDUST AS A DRESSING FOR WOUNDS. — *Cosmos* suggests the use of fine soft sawdust as a dressing for wounds, and as a vehicle for medicaments or antiseptics. It says that the dust, freed from splinters and sharp bits of wood by sifting, when used alone and dry, makes a clean and grateful dressing; that it readily takes up and holds the discharges without packing or adhering; and that it is easily rendered antiseptic by any of the methods used in preparing antiseptic cotton or wool. The *St. Louis Medical and Surgical Journal* suggests that our yellow pine sawdust, rich as it is in turpentine, would prove of itself a valuable antiseptic application.

DANGER IN SILK THREAD. — Silk thread, says *Sanitary News*, is soaked in acetate of lead to increase its weight, and persons who pass it through the mouth in threading needles, and then bite it off with the teeth, have suffered from lead-poisoning.

SOME DOMESTIC REMEDIES IN THE TRANSVAAL. — Mr. Walter H. Haw, in a letter to *The Lancet* upon medical practice in the Transvaal, gives the following list of remedies in which the Boers have the most implicit faith, and to which they recur in many of the ills of themselves and their families: 1. Cow-dung poultices. 2. Stink blaar (*Datura stramonium*) leaves applied for the relief of pain. These act well, and are often used. 3. Prickly-pear leaves skinned and applied. 4. For children, a young goat killed and opened, the child being put in bodily after removal of the viscera, — a good poultice, probably. 5. Rimpis (threads) of eel-skin worn round the painful joints in chronic rheumatism. This was described to me by a man who was wearing one round almost every joint of his body as being a splendid remedy. 6. Rimpis of the tanned skin of a tame goat worn as above for sprains, etc. 7. The finely chopped hair of a black cat, which should not have the faintest trace of white about it, — a remedy for convulsions. 8. A spoonful of dog's blood taken from the ear, for "buur en de mag" ("inflammation of the bowels"). 9. For snake-bite repeated fowl poultices.

EFFECT OF CANNON-FIRING ON THE EIFFEL TOWER. — Of all the indispositions (and there are many) created by the exhibition, according to the Paris correspondent of *The Lancet*, the most curious is that which is caused by the firing of the cannon on the Eiffel Tower. Every evening at ten o'clock, when the gun is fired for the last time in the day, it is not unusual to see produced a sort of frenzy among the young female visitors to the exhibition. Under the already strong impression produced by the illuminations, the luminous fountains, etc., when the gun is fired, they seem to be seized with a veritable panic. It appears to them that a sudden catastrophe, such as a great fire, has taken place. Cries of admiration escape from some, and of terror from others, when fainting,

attacks of hysteria and of prostration, occur. The subject has attracted the attention of Professor Charcot and other physicians.

POISONING BY POTATOES. — In *The Therapeutic Gazette* is an account of serious symptoms of poisoning which occurred in a hundred and one members of a battalion of French infantry. The symptoms were headache, dilatation of the pupils, colic, diarrhoea, sweating, fever, pain in the epigastrium, vertigo, nausea, thirst, troubles of vision, and cramps. The poison was evidently contained in the food, and, after successive eliminations, suspicion rested upon the potatoes, which were withheld for forty-eight hours, with the result that no new cases developed. It was found on examination that the potatoes simply consisted of sprouts, which, as is well known, contain solanine, an alkaloid of a poisonous character, and which produces results similar to those detailed above.

"AMMINOL" FOR THE DISINFECTION OF SEWAGE. — A new method of precipitating sewage has been tested at Wimbledon, England. The *London Times* now devotes a large amount of space to the consideration of this new disinfectant method, which was discovered by Mr. Wollheim of London, and which, in the opinion of *Medical News*, bids fair to revolutionize the sewage question. The disinfecting power of amminol gas is such, that, when introduced into sewage, it very quickly destroys the microbes of putrefaction and of many diseases. The odor of sewage is almost instantly displaced by that of the re-agent, and in less than an hour the sewage thus treated is both deodorized and sterilized. It is reported that Dr. Klein has in part confirmed the claims of the discoverer, in so far that one sample of sewage examined by him was found to be absolutely sterile after having been treated by the amminol method. If this alleged discovery should be verified, it will undoubtedly become one of the most useful discoveries of the present day, and must materially influence the future of sanitary practice.

VARIATIONS IN THE COMPOSITION OF MILK. — From the results of about fifty thousand analyses made in the laboratory of the Danish Dairy Supply Company, and reported in the *Medical and Surgical Reporter*, it is found that the dry matter less fat is an almost constant value (8.7 to 8.8). The fluctuations in total solids depend almost entirely on variations of the fat. The evening milk contains more fat and more total solids than the morning milk. In October and November the milk is richer in fat and total solids than in other parts of the year.

HOW DRUNKARDS ARE TREATED IN NORWAY. — The London correspondent of the *American Practitioner and News* says that a well-known medical man, who has recently been in Norway, gives a glowing description of their manner of treating dipsomaniacs. An habitual drunkard in Sweden and Norway is treated as a criminal in this sense, that his inordinate love of strong drink renders him liable to imprisonment, and while in confinement it appears he is cured of his bad propensities on a plan which, though simple enough, is said to produce marvellous effects. From the day the confined drunkard is incarcerated, no nourishment is served to him or her but bread and wine. The bread, however, it should be said, cannot be eaten apart from the wine, but is steeped in a bowl of it, and left to soak thus an hour or more before the meal is served to the delinquent. The first day the habitual toper takes his food in this shape without the slightest repugnance; the second day he finds it less agreeable to his palate, and very quickly he evinces a positive aversion to it. Generally, the doctor states, eight or ten days of this regimen is more than sufficient to make a man loathe the very sight of wine, and even refuse the prison dish set before him. This manner of curing drunken habits is said to succeed almost without exception, and men or women who have undergone the treatment not only rarely return to their evil ways, but from sheer disgust they frequently become total abstainers afterward.

THE VENOM OF SNAKES. — The venom of the rattlesnake has been frequently made the subject of study, and, while its action as a poison has been generally conceded, some writers have endeavored to prove its efficacy as a drug. Surgeon L. A. Waddell, M.B., says the *Lancet*, has recently been availing himself of his opportunities as a deputy sanitary commissioner in Bengal to de-

termine a point about which it would seem that much uncertainty existed, — the curious question of the effect of serpent-venom on the serpents themselves. In a paper he has published he quotes the contradictory conclusions arrived at by previous experimenters, and endeavors to show, that, from the accounts of the experiments, it by no means followed that death, when it occurred, was the result of auto-toxic action. Accordingly, he felt that the question was still open, and proceeded to some very interesting investigations, conducted under different conditions of temperature and season, verifying his results by control experiments upon other animals and by *post-mortem* examination of the snakes he employed. In every case the fresh venom was injected into the cobra with an ordinary hypodermic syringe; the serpents operated upon were all healthy, and had recently been caught; the snakes were kept under observation from nine to fifteen days subsequently, and were then killed. The experiments generally confirm and extend the principle formulated by Fontana in 1765, that the venom is neither a poison to the snake itself nor to those of its own species. This immunity is not to be explained upon the mere fact of the animal being cold-blooded, or upon the anatomical conformation of ophidians, since most, if not all, of the non-venomous snakes are susceptible to venom. Surgeon Waddell suggests that it may result from a toleration established through frequent imbibition of the venom in the modified or attenuated form which it assumes when mixed with salivary and gastric juices and absorbed through the alimentary canal; and in support of this hypothesis he mentions the popular belief that certain snake-charmers, by a process of inoculation with venom, gain protection against the bite of a particular species of venomous snake. If this hypothesis can be verified by further experiments, it will go far towards affording indications for combating the action of the venom on man. The subject is of such importance, and the experiments detailed appear so conclusive, that we look forward with interest to the further prosecution of this inquiry.

NOTES AND NEWS.

A SCHEME for bridging the English Channel has actually been discussed by the Iron and Steel Institute of Great Britain. The cost is set by the projectors at \$170,000,000. The danger to navigation, aside from any considerations of cost, is likely to be enough of an objection to prevent the accomplishment of the project for many years to come.

— The International Medical Congress, we learn from *Nature*, will meet next year in Berlin, from Aug. 4 to Aug. 10. Inquiries by intending visitors should be addressed to the general secretary, Dr. Lassar, Karl Strasse, Berlin. The congress will be divided into eighteen sections, and the official languages will be German, English, and French.

— According to *Nature*, the Ethnographic Congress, which held meetings of its various sections every day of the week ending Oct. 5, in Paris, brought its proceedings to a close on Monday afternoon, Oct. 7, in one of the large halls of the College of France. It was decided that the congress should hold its next meeting at Bucharest in the autumn of 1890.

— At the first regular meeting of the Boston Society of Arts, held at the Institute of Technology, Oct. 10, the paper of the evening, as we learn from the *Boston Medical and Surgical Journal*, was upon "Biological or Chemical Water-Analysis," by Professor W. T. Sedgwick of the institute. He analyzed different waters, claiming that one-third of a teaspoonful of Cochituate water, tested by the gelatine process, contains sixty to one hundred bacteria, and yet is as pure as the average water. The State Board of Health was highly commended for its practical system of analyzing water. After an interesting exhibition of filtered waters and vegetable deposits through sand, the meeting was adjourned.

— The Philadelphia *Inquirer's* Pittsburgh special, Oct. 15, says, "That the natural-gas supply in that and adjoining districts has passed its zenith, and is now upon the wane, can no longer be satisfactorily denied. The reason usually given was that new mains were being laid to the wells, or that the size of those already down was being increased. These changes have all been made, and still the desired fuel does not pour through in the necessary

quantities. This state of affairs was first noticed, the latter part of last winter; but the coming of warm weather relieved the pressure for domestic purposes, and nothing was heard of a shortage during the summer months. But with the first appearance of a change of temperature this fall the trouble recommenced in an aggravated form. The last move of the natural-gas companies has been to ask the big mills to run only at night, when the demand upon the fuel for other purposes would be slight. Many of the establishments have decided to return to the use of coal, and some have already done so."

— The British consul-general at Constantinople, in his last report, refers to the declining commercial importance of that city. Its trade has suffered considerably since 1878, and more particularly during the past two years. Large wholesale houses which formerly did business with Persia and central Asia, and acted as middlemen between European manufacturers and the merchants of those parts, have in recent years lost their customers, and are gradually disappearing from the city. This is owing, in a measure, to new and more direct routes having been thrown open to markets that were formerly supplied from Constantinople, and also to the fact that produce which used to go to the Turkish capital for shipment to Europe is now despatched direct from the outports. Persia, which previously drew a considerable part of her imports from Constantinople, has latterly commenced to make use of Bushire, and the entire import trade of lower Persia is at present centred in that place. The provinces of Azerbaijan and Mazanderan alone continue to take their supplies by way of Constantinople, and then only when Russian competition permits of their doing so. The export trade of the city has suffered in a similar way. The produce of Turkish Kurdistan, estimated to amount to an annual value of £320,000, which two years ago went through the capital, is now shipped from Bagdad, — a route which is considered to be less expensive and safer. As regards Persian trade especially, Mr. Fawcett observes that during the years 1887-88 it was not satisfactory.

— Two items which appeared on p. 250 of our issue of the 11th inst., — one in relation to the deepest hole in the world, and the other touching the effect of gas on asphalt pavements — should have been credited to *The Engineering and Building Record*. A feature of this journal in which many of our readers would be interested is the insert architectural drawing given each week. These drawings are remarkably well chosen, and are reproduced and printed especially well.

— The *Engineering and Mining Journal* announces that a movement has been started to erect a monument to the joint memories of Fulton and Ericsson in Trinity Churchyard, New York. The idea originated out of an application which has been made, and which is likely to be granted, for the interment of the great Swedish inventor's remains in the Livingston Manor vault, which would, as it happens, place them immediately next to the grave of Robert Fulton, so that a joint memorial would seem to be especially appropriate.

— The National Council of the Phi Beta Kappa Society, at its triennial meeting at Saratoga in September, appointed a committee to consider means of securing, in connection with the proposed national commemoration of the discovery of America in 1892, "a proper representation of the intellectual life of the American people, as manifested by their progress in science and literature." The committee was instructed especially to consider, according to *The Publishers' Weekly*, the preparation of a "monumental work," to comprise a series of monographs on the progress of our people, during the four centuries since the discovery by Columbus, in science and literature. The committee was authorized to offer two prizes, of \$3,000 each, "for the best general essays on the progress of science and literature respectively; such essays to embrace a philosophical discussion of the development in the past and of the outlook for the future." The committee appointed is a thoroughly competent and admirably representative one, its members being Bishop Henry C. Potter, chairman; President Eliot of Harvard University; President Dwight of Yale; President Gilman of Johns Hopkins; President Adams of Cornell; President Angell of the University of Michigan; and President Northrup of the University of Minnesota.

— Attempts to prevent the formation of smoke have hitherto mainly had reference to the grate or furnace. Recently there has been exhibited in London a method in which the coal before use is treated chemically, by a process the details of which we have not learned, but which results in no deterioration of the heat-producing qualities of the coal, while it prevents its burning with an excess of smoke. The coal seems to be hardened by this process, which is said to cost not more than twelve cents a ton.

— Professors L. H. Baily, E. S. Goff, and W. H. Green were appointed at the last meeting of the Association of Agricultural Colleges and Experiment Stations to report on the nomenclature of kitchen-garden vegetables. In their report, just issued by the Department of Agriculture, and summarized in *Garden and Forest*, after stating that a name is bestowed upon a plant solely for the purpose of designating, and not for describing it, the committee lay down the following rules: 1. The name of a variety should consist of a single word, or at most of two words. A phrase, descriptive or otherwise, is never allowable; as, "Pride of Italy," "King of Mammoths," "Earliest of All." 2. The name should not be superlative or bombastic. In particular, all such epithets as "New," "Large," "Giant," "Fine," "Selected," "Improved," and the like, should be omitted. If the grower or dealer has a superior stock of a variety, the fact should be stated in the description immediately after the name rather than as a part of the name itself; as, "Trophy, selected stock." 3. If a grower or dealer has procured a new select strain of a well-known variety, it shall be legitimate for him to use his own name in connection with the established name of the variety; as, "Smith's Winningstadt," "Jones' Cardinal." 4. When personal names are given to varieties, titles should be omitted; as, "Major," "General," "Queen." 5. The term "hybrid" should not be used, except in those rare instances in which the variety is known to be of hybrid origin. 6. The originator has the prior right to name the variety; but the oldest name which conforms to these rules should be adopted. 7. This committee reserve the right, in their own publications, to revise objectionable names in conformity with these rules.

— The following description of the way in which floating fields and gardens are formed in China is from an article by Dr. Macgowan, in the *China Review*: "In the month of April, a bamboo raft, ten to twelve feet long and about half as broad, is prepared. The poles are lashed together with interstices of an inch between each. Over this a layer of straw an inch thick is spread, and then a coating two inches thick of adhesive mud taken from the bottom of a canal or pond, which receives the seed. The raft is moored to the bank in still water, and requires no further attention. The straw soon gives way, and the soil also, the roots drawing support from the water alone. In about twenty days the raft becomes covered with the creeper *Ipomœa reptans*, and its stems and roots are gathered for cooking. In autumn its small, white petals and yellow stamens, nestling among the round leaves, present a very pretty appearance. In some places marshy land is profitably cultivated in this manner. Besides these floating vegetable-gardens, there are also floating rice-fields. Upon rafts constructed as above, weeds and adherent mud were placed as a flooring; and when the rice shoots were ready for transplanting, they were placed in the floating soil, which being adhesive, and held in place by weed-roots, the plants were maintained in position throughout the season. The rice thus planted ripened in from sixty to seventy in place of a hundred days. The rafts are cabled to the shore, floating on lakes, pools, or sluggish streams. These floating fields served to avert famines, whether by drought or flood. When other fields were submerged, and their crops rotten, these floated and flourished; and when a drought prevailed, they subsided with the falling water, and, while the soil around was arid, advanced to maturity. Agricultural treatises contain plates representing rows of extensive rice-fields moored to sturdy trees on the banks of rivers or lakes which existed formerly in the lacustrine regions of the Lower Yangtze and Yellow Rivers."

— A method for coating porcelain with platinum is described as follows: The porcelain is first covered with platinum chloride to which a little hydrochloric acid has been added. It is then exposed in a muffle to a temperature of 1,000°–1,200° for twenty

minutes. This operation is repeated till a sufficient coating is secured.

— President D. C. Gilman has gone abroad for an absence of some months. While he is away, Professor Ira Remsen will act as president of Johns Hopkins University.

— At the close of the Paris exposition the Belgian exhibits will be mainly transferred to London, where they will form part of a Belgian exhibition to be opened next year. It is to be feared, if we may judge from the emptiness of the Spanish exhibition in London, that this special exhibit may not prove financially successful.

— In Sweden, which boasts being the fatherland of modern explosives, a considerable amount of time and attention is constantly given to experiments in this direction; and an engineer, Mr. J. W. Skoglund, has recently invented a new explosive, which so far, according to *Engineering*, has given great satisfaction. It is called "gray powder" (Swedish *grakrüt*), and has during the summer been tested at Rosersberg Gunnery School, in addition to which it will be further tested in the course of the present month by a special commission, and to a considerable extent for comparison with a Belgian powder called *poudre de papier*. It has also been accepted for trials at the fleet. According to the official reports, the gray powder has been used with 25-millimetre as well as with Nordenfält's machine guns. The former has, with 70 per cent of the new powder against 100 per cent (or the usual charge) of ordinary powder, given a 33 per cent greater initial velocity, without the pressure in the gun being increased more than 5 per cent. With 62 per cent (ordinary charge weight) of gray powder, the initial velocity was increased with 24 per cent without any perceptible increase in pressure. With a charge of 74 per cent (ordinary charge weight) the initial velocity was increased 40 per cent, without the gun being subject to any undue pressure. With regard to the important question of smokelessness, the report states, that, while with Nordenfält's machine-guns smoke of ordinary powder remains for twenty-five seconds, the gray powder only leaves a transparent steam, which is only visible for five seconds.

— It is satisfactory to learn, on the authority of M. Gulishambaroff, that there is not the slightest ground for the absurd rumor, set in circulation by the acting consul at Batoum, that the Baku oil-supply had begun to show signs of exhaustion. M. Gulishambaroff is the chief petroleum adviser of the Russian Government, and recently has been conducting an investigation into the oil-industry of this country, in conjunction with Mr. Marvin. Having only just arrived from Baku, after one of his regular official visits, he is in a position to speak with authority on the position of affairs in that quarter, irrespective of that general knowledge of the Baku industry, from the earliest time of its European development, which has resulted in the publication of so many books on the subject. So far from there having been a "cave-in" of the supply, says *Engineering*, there has really been a "shut-down" of a large number of wells, to check a wasteful over-production. Instead of 500, only 200 wells have been at work this autumn. Moreover, in order to put a stop to the waste of oil on the surface, the Russian Government has been lately discouraging the commencement of new wells outside the present limit. Administrative action of this sort has long been advocated by Marvin and other non-Russian writers, as well as by Russians themselves. It is no uncommon thing for a native of Baku to tap a supply of 20,000,000 gallons of oil, and waste 19,000,000 out of it, simply from want of foresight in providing a cap for the well, or by the omission to arrange for surface storage. Waste of this character has become such a scandal that to check it the authorities now seize a well that is not properly managed, and empower the neighboring well-owners to gag the supply at the culprit's cost. In view of the rapid increase in the demand for petroleum, it is a satisfaction to know that Baku is as prolific of oil as ever. The oil-trade is rapidly assuming such gigantic proportions that for many a year there will probably be ample room for America, Russia, and Burmah, as well as for the minor fields that will in time furnish a supply for the world's market. But, in any case, petroleum ought not to be wasted as it has been at Baku, and it will be a good thing for Russia when the more careful and economical methods of America are adopted in the Caspian region.

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Attention is called to the "Wants" column. All are invited to use it in soliciting information or seeking new positions. The "Exchange" column is likewise open.

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AMERICAN PUBLIC HEALTH ASSOCIATION.

THE seventeenth annual convention of the American Public Health Association was opened Tuesday in the Brooklyn Institute. About two hundred members from all parts of this country and Canada were present.

The first paper was upon "The Overshading of Our Homes," by Dr. William Thornton Parker of Newport, R.I. It was read by Dr. C. A. Lindsley of New Haven. In the paper the writer said in part, "Overshading is a serious fault, and directly lessens the value of real estate, and noticeably increases disease and shortens life. Houses overshadowed are not healthful, no matter how commodious or well built they may be. This condition of overshadowing is very noticeable in our New England and Middle States towns. The white faces and sickly appearance of so many of our people are largely attributable to this cause, and suggest that medical men should call attention to the growing evil. Where houses are overshadowed, the nervous system also suffers, as well as the general bodily health." The discussion brought out clearly that this is a subject on which doctors disagree.

Dr. Lindsley said that it was his belief that the great number of trees in New Haven was unquestionably the cause of much malaria and other disease in that city. Dr. Henry P. Walcott of Massachusetts remarked that he had lived in a town as much shaded as New Haven, and found no harm from the great number of trees, but a direct benefit. Dr. George M. Sternberg, U.S.A., believed that many malarious places were redeemed by the planting of trees. Dr. Gilhon of Washington mentioned the fact that the Roman Campagna had been freed from malaria to a great degree

by the planting of eucalyptus trees. The swamps in California were dried in the same way.

The second paper, upon "Clothing in its Relation to Hygiene," was by Dr. James F. Hibberd of Richmond, Ind. His conclusions are that many persons dress too warmly, and thus induce disease. Most persons only regard the amount of clothing to be worn so that it should protect sufficiently against cold, and wholly disregard the effect of over-heating and thus disarranging the functions of the skin.

Dr. Hibberd maintained that an insufficiently clothed person was not the one who caught cold, but it was the overclad one who was most subject to it.

He summed up as follows: "It seems time that the relation of clothing to the health of the people of temperate climates engaged in civil industries should be reviewed, and the points for investigation may be summarized thus: viz., 1. The popular and professional estimate of the hygiene of the skin is much below its real importance; 2. The physiology of the skin cannot be largely interfered with without endangering the general health; 3. One of the influential factors in the sound health of man is to establish and maintain in his organization a resisting power to the causes of disease; 4. The tendency is to overdress, enervating the skin, and curtailing its power, and thereby the power of the whole system, to resist the causes of disease; 5. A proper exposure of the surface of the body to environing low temperature is a valuable general tonic; 6. Ventilation of the skin is indispensable to good health; 7. Habit may enable one to bear wide differences in clothing under similar surroundings without detriment, and this should impress the necessity of cultivating correct habits of dress.

A paper on "Causes and Prevention of Infant Mortality" was presented by Dr. Jerome Walker of Brooklyn. Dr. Walker finds from statistics that the common belief was not sustained that infant mortality in this country had decreased of late years. The hope of the future lies in a radical change, so that mere political doctors may not control the health boards, and in the sanitary education of the masses. The speaker said, "We may conclude from what is known of institutions for children, (1) that a large proportion of the deaths in them are preventable; (2) that the younger the children and the larger the number, the greater the mortality; (3) that the mortality can be lessened, but the decrease costs money, time, patience, and energy; and to obtain the best results the attending and resident physicians should be reliable, should be given control over all medical and sanitary matters, and should be held responsible for the same."

In the next paper, on "The Relations of the Dwellings of the Poor to Infant Mortality," by Alfred F. White, C.E., of Brooklyn, were quoted statistics to show that such institutions as the Peabody Association of London were needed here. Through the reforms thus instituted in tenement-house construction, the infant mortality of London had been reduced to 15 per cent of all deaths, while in this city it was 26 per cent.

Dr. George Homan of St. Louis, secretary of the Missouri State Board of Health, read a paper advocating the employment of better men as local health-officers at higher pay.

In the evening the delegates and their friends went to the Academy of Music. Dr. J. H. Raymond opened the exercises with a short address of welcome. Mayor Chapin welcomed the delegates on behalf of the city, and Dr. Hutchins performed a similar office for the medical profession. Then came the address of President Johnson. His purpose, he said, was to talk to the people, not to scientists. He said, —

"A death from typhoid-fever now means not so much a dispensation of Providence as it means foul water, foul food, or foul air. A city is decimated by a pestilence, and it is found that its foundations are honeycombed with cesspools, and its drinking-water is diluted sewage. The judgments of God, in the light of these revelations, become no more mysterious than the pains of the child that laughingly thrusts its tiny finger into the brilliant flame only to feel the terrible infliction that follows. There has come to be an enthusiasm in the medical profession on this subject which has made itself felt in various ways. This zeal has communicated itself to the public. An intelligent foundation has been laid for sanitary reforms.

"As typhoid-fever is a greater calamity than Texas fever, as Asiatic cholera is more to be dreaded than hog cholera, so do we need a department of public health more than a department of agriculture, a bureau of vital statistics more than a bureau of animal industry.

"The death-rate of twenty-six of the principal cities of America, with a population of 9,873,448, is 20 per 1,000. I think it morally certain that this rate could be reduced by means and methods now known to sanitary science to 16 per 1,000, and probably still less than that. The death-rate for London for the year 1888 was 18.5 per 1,000. This can be still further reduced. That of New York and Brooklyn for the same year, taken together, is 25.5 per 1,000; New York, 25.9; Brooklyn, 23.7. The death-rate of these two cities, if reduced to that of London, would secure a saving of 7 per 1,000, or annually 15,986 lives. These lives are public wealth.

"But this is not all. For one death annually two persons are sick during the entire year, or, in other words, there are two years of disabling sickness to one death, 31,972 years in New York and Brooklyn of sickness, preventable sickness, annually. The value of these years of sickness cannot be reached with accuracy; but the wages lost on account of sickness, the cost of care and maintenance during sickness and convalescence, and the money-value of the lives destroyed, considering them only as machines, will, in New York and Brooklyn, reach annually into the millions. I venture to suggest to the business-men of these cities that this loss is enough every year to buy a great railroad or to build and subsidize a fleet of ocean-going steel steamships."

The session continues through Friday, while the sanitary exhibition will continue for some weeks.

PROGRESS OF CHINA.

MR. R. S. GUNDRY read a paper on "Industrial and Commercial Progress in China" to the British Association last month. Premising that the wide differences in character and habits of thought between Europeans and the Chinese made it difficult to convey to an English audience an accurate impression of the situation, the paper, as reported in *The Scottish Geographical Magazine*, went on to sketch the leading features of Chinese industry and commerce in so far as they concerned, and had been affected by, foreign enterprise. Beginning to move at a time when she had been defeated in a foreign war, China's first efforts were to provide herself with the warlike material which experience had shown her to be so powerful: hence the early construction of arsenals and steamers. The beginnings of telegraphs, and the acceptance in principle of railways, were due also, in a measure, to warlike stress in connection with Kulja and Tongking; and mining was recognized largely as a means of providing for all this additional expenditure. But imperfection of knowledge, jealousy of foreign supervision, and a disorganized condition of finance, which involves venality and harassing taxation, retard a progressive movement, to which the *literati* who constitute the mind of the nation are still as a body disinclined. The imperial finances, too, have been strained by a series of wars, rebellions, and disasters; and distrust of their officials prevents native capitalists from investing money in enterprises with which the officials persist in meddling. The great staples of tea and silk are severely menaced by the competition of India and Ceylon in the one case, and of southern Europe in the other; and the Chinese are slow to accept improved methods of preparation which would enable them to hold their own. China tea is heavily handicapped also by taxation, in competition with its duty-free rival. Fiscal hinderances, imperfect communications, and consequent cost of transport, have much to do with the slow development of trade. But the wide prevalence of domestic industry, and difficulties of exchange caused by the demonetization of silver, tend also to check the anticipated growth of demand for European manufactures. There seems every prospect that more railways will shortly be constructed, and that machinery will be tentatively admitted for purposes of industrial manufacture; but much time, a more widespread desire for progress, and radical financial reform, will be required before China is likely to rival Japan in the completeness of its transformation.

JADE IN BURMAH.

ACCORDING to a recent official report from Burmah, the jade-producing country is partly enclosed by the Chindwin and Uru Rivers, and lies between the 25th and 26th parallels of latitude. Jade is also found in the Myadaung district, and the most celebrated of all jade deposits is reported to be a large cliff overhanging the Chindwin, or a branch of that river, distant about eight or nine days' journey from the confluence of the Uru and Chindwin. Of this cliff, called by the Chinese traders "Nantclung," or "difficult of access," nothing is really known, as no traders have gone there for at least twenty years. Within the jade tract described above, small quantities of stone have been found at many places, and abandoned quarries are numerous. The largest quarries now worked are situated in the country of the Merip Kachins. The largest mine is about 50 yards long, 40 broad, and 20 deep. The season for jade operations begins in November, and lasts till May. The most productive quarries are generally flooded, and the labor of quarrying is much increased thereby. In February and March, when the floor of the pit can be kept dry for a few hours by baling, immense fires are lighted at the base of the stone. A careful watch is then kept in a tremendous heat to detect the first signs of splitting. When this occurs, the Kachins attack the stone with pickaxes and hammers, or detach portions by hauling on levers inserted in the cracks. The heat is almost insupportable, the labor severe, and the mortality among the workers is high. The Kachins claim the exclusive right of working the quarries, and there is not much disposition on the part of others to interfere. Traders content themselves with buying the stone from the Kachins. The jade is then taken by Shan and Kachin coolies to Nainia Kyank-seik, one long day's journey from Tomo. Thence it is carried by dug-outs down a small stream, which flows into the Tudaw River, about three miles below Sakaw, and down the Tudaw River itself to Mogaung.

MENTAL SCIENCE.

New Experiments upon the Time-Relations of Mental Processes.

IN the preceding issue of this department an account was given of certain experiments measuring the time of re-action to words, both simply and when the movements of the five fingers were associated respectively with five words or five general classes of words. The results revealed a striking difference, according as the attention is directed to the sensory factors of the process and their appreciation, or the motor factors and their execution. The latter is a much briefer act, and seems to require a quite different series of mental processes from the former. To the theories explaining these and other facts we shall recur in this study. Dr. Münsterberg continues the work by applying similar methods to the study of association, judgments, and in general more complex operations.

I. As the more mechanical process in every association consists in hearing and understanding a spoken word and in speaking a word, we can easiest measure how much time is needed to accomplish this part of the process by measuring the time intervening between the speaking of a word by the experimenter and the repetition by the subject. Throughout this study there are two subjects, M and R; and in addition to the time there is given in parentheses the average variation, v , which marks the relative constancy, regularity of the process measured. As the words used in later experiments were both monosyllables and others, these were introduced at the outset, care being taken by the experimenter when calling a polysyllabic word to press the key in speaking the last (or the last accented) syllable, and by the subject always to press the key when speaking the first syllable of his reply-word. The simple repetition of a word, then, was accomplished by M in .403 of a second (v , .060); by R, in .362 of a second (v , .070).

II. Here, instead of repeating the called word, one re-acts by calling as quickly as possible a word associated in any way whatever with the first; that is, an ordinary "association-time." M does this in .845 of a second (v , .140); R, in .948 of a second (v , .170). The shortest time was for "gold-silver" (.390 of a sec-

ond); the longest, for "sing-dance," "mountain-level" (from 1.100 to 1.400 seconds).

III. Instead of accepting the first association formed with the call-word, the experimenter requires a word bearing a definite relation to that word. What this relation is to be is announced just before the call-word itself. The relation is always such as to admit of several replies. Such general rubrics as, given a country to name a city in it, or given a general term to name a particular instance of it, sufficiently well describe what was wanted. However, the same rubric was not repeatedly given in succession, as Cattell had done (for this gives too much scope for preparing the answer), but all kinds of relations were employed in an arbitrary order. This "limited" association occupies M .970 of a second (*v*, .200), and R 1.103 seconds (*v*, .210); or .125 and .155 of a second longer than II. The shortest times were found, rather suggestively, in naming an instance of "a German wine, — Rüdshheimer;" "a number between 10 and 4, — 6;" "a Greek poet, — Homer;" — all between .450 and .600 of a second. The longest were "beast of the desert, — lion;" "French author, — Voltaire;" "a drama of Goethe, — Götz;" — between 1.200 and 1.500 seconds.

IV. Here the associations were still further limited, there being in each case only one correct association: it is in the nature of question and answer. Though, of course, the question was not asked in full, it was easily understood as such; nor was the query such as to immediately suggest an evident answer. The average time was, for M, .808 of a second (*v*, .180); for R, .889 of a second (*v*, .140); or .162 and .214 of a second shorter than III. It thus takes longer to name a drama of Schiller, than *the first* drama of Schiller. Times between .400 and .600 of a second were, "Three times four, — Twelve;" "On what river is Cologne? — Rhine;" "In what season is June? — Summer;" "In what continent is India? — Asia." The longest times, 1.100 to 1.300 seconds, were needed to answer the following questions: "By what author is Hamlet? — Shakspeare;" "What is the capital of Baden? — Karlsruhe;" "What is the color of ice? — White;" "Who was the teacher of Plato? — Socrates." These times seem to be influenced by momentary fluctuations of the mind as well as the intrinsic difficulty of the question.

V. As in IV., there is but one correct answer: but this is not obtained simply as an act of memory, but some process of comparison and judgment must be gone through after the question is proposed; e.g., "Which is larger, — a lion or a mouse?" "Who is greater, — Hume or Kant?" First the general nature of the comparison is announced, then the special terms to be compared. An actual test shows no difference in time when the correct answer was the first and when it was the second of the two terms. M's average time was .906 of a second (*v*, .180); R's, 1.079 (*v*, .220) seconds. Most quickly answered (.600–.800 of a second) were, "What smells better, — cloves or violets? — Violets;" "Who is greater, — Virgil or Ovid? — Virgil;" "What is prettier, — woods or mountain? — Mountain." It took longest (1.200–1.500 seconds) to answer, "What is healthier, — swimming or dancing? — Swimming;" "What of Goethe do you know better, — drama or lyric? — Lyric;" "What is more difficult, — physics or chemistry? — Chemistry."

VI. This variation consisted in employing the same general line of questions as in the foregoing, but preceding the question with a series of about a dozen words of the same general class as the two to be compared, and mentioning the two among the number. Thus, "Apples, pears, cherries, nuts, peaches, grapes, strawberries, dates, figs, raisins: which do you like better, — grapes or cherries? — Cherries." The questions were prepared in advance, and read as monotonously as possible. The result was, for M, .694 of a second (*v*, .130); for R, .659 of a second (*v*, .160); or .212 and .420 of a second shorter than V., — certainly a striking result. Among the shortest times (.400 to .600 of a second) were "[mentioning twelve composers] Who is greater, — Glück or Bach? — Bach;" "[twelve capitals] Which is more important, — Rome or Madrid? — Rome." Among longest times (.800 to 1.000 second) were "[ten classical dramas] Which is more taking, — Götz or Tasso? — Götz;" "[ten colors] Which goes better with blue, — yellow or green? — Yellow."

VII. Here we combine III. and V. Instead of first asking, "What is a drama of Goethe?" (III.), and then "Which is the finest of Goethe's dramas, — Götz, Faust, etc.?" (VI.), we ask at once, "Which is the finest of Goethe's dramas?" the subject having first to recall what the dramas are, and then to make his choice. For this, M requires .962 (*v*, .180), and R 1.137 (*v*, .160), seconds; or only .008 and .034 of a second more than in III. The shortest times (.600–.700 of a second) were in answering "What is the pleasantest odor? — Rose;" "Which is the most important German river? — Rhine;" the longest (1.400 to 1.600), in answering "Who is the most difficult Greek author? — Pindar;" "Who is your favorite French writer? — Corneille."

VIII. By adding a comparison to the process in VII., we have the scheme of VIII.: e.g., "Which is the more westerly, — Berlin, or the most important German river? — [answer] Rhine;" or, "What letter comes first in the alphabet, — L, or the initial letter of the name of the prettiest tree? — [answer] Beech." This very complex process engaged M for 1.844 seconds (*v*, .370), and R for 1.866 seconds (*v*, .340). Here the variations in the difficulty of the questions and the alertness of the individual become rather important. A still more complicated scheme was attempted, but the results proved too variable. The questions were of this type: "What is more impressive, — Shakspeare's finest drama, or Wagner's finest opera? [answer] Lohengrin." The result for M was 2.197 seconds (*v*, .970); for R, 2.847 seconds (*v*, .720). It is the scheme of VIII. with case VII. in each term of the comparison.

IX. This bears the same relation to VIII. that VII. does to IV. The type of query would be, "Which lies more westerly, — Berlin, or the river on which Cologne is situated [it is a comparison in which one term is reached by the substitution of a concrete for a generally described term]?" or, again, "Which is less, — 15, or 20 — 8?" "Who lived later, — Klapstich, or the author of 'Lear'?" The times were, for M, 1.291 seconds (*v*, .180); for R, 1.337 seconds (*v*, .230). These times are .553 and .529 of a second less than VIII., although the differences between VII. and IV., which have the same relation pair to pair, were only .154 and .248 of a second.

X. This is IX. preceded by a series of words of the same category as the terms of the comparison: e.g., the experimenter first calls twelve names of parts of the body, and then, "Which is larger, — the hand, or that with which one smells?" "[ten colors] Which is lighter, — blue, or the color of sulphur?" Here we have the same process of shortening the time as in VI. The times are 1.153 seconds for M (*v*, .170), and 1.145 seconds for R (*v*, .210); or .138 and .192 of a second less than IX. The results of the ten cases are based upon about 800 experiments.

Finding the current theory¹ entirely unable to explain these results, Dr. Münsterberg attempts an explanation upon the principle "that a stimulus begins to have an effect before the latter is consciously perceived," and that "the process consists in the re-awakening of the effects of previous stimuli, so that it is shortened by any circumstances tending to call up these reproductions in advance of the stimulus." We must note that all these associations are really of the form of judgments. When we are asked to associate a word with a given word, we really do not answer with the first impression that may be passing through our minds at that particular moment; but we give a word called up by the former, and the relation to which we more or less clearly recognize. The question is, "Name a word standing in some relation to the following word;" and our answer is, "This word answers this description." Every such judgment, again, is the assertion of identity between two objects standing in different associative relations. When we say the beech is the prettiest tree, we mean that the thing that from one aspect we call and recognize as a beech, and the concept which from another aspect we describe as the prettiest tree, are one and the same.

The mind can be placed in more or less favorable attitude for the calling-up of these association ties, and thus the time as measured be shortened; and again the calling-up of certain associative

¹ The theory as represented by Wundt would require the limited association to take longer than the unlimited, because it involves the latter and something more; but IV. requires less time than III. or II. Again, as VII. is composed of III. and V., we should get the times by the addition of these two times; but this gives far too large results. Other discrepancies could easily be pointed out.

links may in itself be a sufficient means of appreciating the appearance of other closely related trains of thought. Under this general position, it remains to interpret the following four characteristics of the results, which may be regarded as the most essential outcome of the study: first, the time of a limited association is longer than the time of a free association (III. is longer than II.); second, univocal association (where the answer is limited to one) is less than the limited, or even than the free (IV. is less than III. or II.); third, by reading a series of words belonging to the same category as the words to be compared, the time of the mental process is much shortened (VI. is less than V., and X. than IX.); fourth, the combination of any two or three factors in the same process takes less time than the sum of the times needed to perform each of the factors separately (VII. is less than the sum of III. and V., less the time of I., which is counted twice). The first fact is not new, and is explained by considering that in both cases, III. and II., several associations present themselves to the mind, but that, while any one of them will answer in II., some may have to be rejected (or the association impulse inhibited) in case III. The second fact is more striking, and seems to mean that the mind does not run over the general category and select the one answering to the particular relation, but takes the nearest and usually prominent association of the limited character. Irrelevant associations do not consciously reach the focus of apperception. The third fact brings out the mechanism of preparation. When a series of words is read, and we know we are to compare some two terms of the series, we anticipate the general kind of comparison, and so shorten the process. We throw out all those associations with the terms in question other than those which they have in common with the series of words read. The fourth fact accentuates the importance of the position that the mind can do more than one thing at a time. If each mental process had to be finished before the next one is begun, such acts as reading ahead, as forming a sentence or an argument while speaking other words, would be impossible. The results distinctly show how the various processes overlap in time, and form that rich complexity of inter-associated and mutually dependent factors that is the charm as well as the strain of mental labor.

THE NATURE OF NEGATIVE HALLUCINATIONS.—M. J. Foutan has recently devised an interesting method of showing that in hypnotism the physiological processes remain, while their psychic interpretation is altered. If a subject be told that he sees nothing red, every thing of this color falls out of his mental horizon, and we have an ordinary instance of a negative hallucination. If, now, the red object viewed be a red light, and if we suggest to the subject that when a bell is sounded he will again be restored to normal vision, and if as the bell is sounded the light is put out, the subject sees a light of the complementary color, green, just as he would have done when normally viewing a red light. While the brain refuses passage to the sensation of red, the retina is impressed with it, and re-acts to it, just as though the action were normal in every respect.

ELECTRICAL NEWS.

The Telephone on Railways.

THERE has been in use on the Austrian State railways a portable telephone that can easily be attached to a passing wire so as to place the trainmen in connection with the neighboring stations. An exhibition of the apparatus was recently made before a number of Austrian railway-men on a line running from Hüttelsdorf to Purkersdorf, with satisfactory results.

THE DURATION OF A LIGHTNING-FLASH.—The researches of Trouvelot, Colladon, and Dufour have shown that the duration of a lightning-flash is not infinitesimal, but that the flash lasts a measurable time. For instance: if one sets a camera in rapid vibration, and exposes in it a plate so as to receive the impression of the flash, it is found that the impressions appear widened out on the negative, showing the negative to have moved during the time the flash was in existence.

ARTHUR WINSLOW has entered upon the duties of State geologist of Missouri, with headquarters at Jefferson City, and the work of the survey is now begun.

BOOK-REVIEWS.

The Struggle for Immortality. By ELIZABETH STUART PHELPS. New York, Houghton, Mifflin, & Co. 16°. \$1.25.

THIS book is characteristic of the times, and could not have been written at any other period. The authoress is a Christian of the new liberal type, — a type so different from the old that it seems another thing, — and she is a passionate believer in immortality. She presents her views and arguments in an epigrammatic style and generally with clearness, and her book is certainly entertaining. Unhappily she is a pessimist of a rather extreme type, declaring expressly that there is far more pain than pleasure in this life, and consequently, that, if there is no other life before us, God is not good. She admits, however, that with rare exceptions men cling tenaciously to this life, which seems very strange if it brings a surplus of pain. She insists that there is more in man than material forces can account for, and adduces the phenomena of hypnotism and telepathy in support of this claim. Her theory of immortality is as set forth in the following passage: "Immortality is not a right, but a privilege. . . . This gift is offered to you or me upon conditions which we can accept or deny at will. The founder of our religion makes, we may say that he constitutes, the conditions. Everlasting life is, in fact, according to this religion, bestowed by Jesus Christ upon the human soul. The consequence of declining this gift and its conditions would seem to be logically, if not theologically, wrapped in the phrase 'everlasting death'" (p. 137). This means, if we understand it, that, if we live like Christ in this world, we shall live forever in another and happier one; but if not, we shall be annihilated. Hence arises a "struggle for immortality" analogous to the struggle for existence here, in which we may win or lose according to our conduct. This seems to us rather singular doctrine; yet there is much in the book that is both true and valuable, and it will serve to some extent as an antidote to the prevailing spirit of negation.

A Dictionary of Electrical Words, Terms and Phrases. By EDWIN J. HOUSTON. New York, The W. J. Johnston Co. 16°. \$2.50.

THE need has long been felt of some work that should give good definitions of the terms which have come into use in the electric science and practice that have been brought into existence mainly within the past ten or twenty years. The larger dictionaries are too slow in adopting new words to serve this special purpose. In fact, some of the terms defined in Houston's "Dictionary" may be out of use, and no longer words in any proper sense as conveyors of ideas, by the time they figure in Worcester or Webster. Such is the march of language with those who are creating apparatus and phenomena never before existing. It is unnecessary to introduce the chief editor of this electrical dictionary to our readers. Professor Houston is too well known to need this. What he has done in the dictionary is, first, to give a concise definition of each word or phrase, and then a brief statement of the principles of the science involved in the definition, that it may be clear, in so little trodden a field, just what the definition means. This statement is frequently illustrated by appropriate cuts. To some extent the short explanations make the work encyclopedic in its character.

This is a first edition, and it may be that the difficulty of introducing a phrase under the most appropriate catch-word, so that it may be readily found, has not been completely overcome; yet such an elaborate system of cross-references has been introduced as to overcome this trouble to a great extent. We must say we have found it satisfactory in use so far.

The publishers are to be commended for the large number of illustrations they have placed at Professor Houston's command.

AMONG THE PUBLISHERS.

THERE is announced to appear Nov. 2, 1889, and each Saturday thereafter, *Nature*, a weekly journal for the gentleman sportsman and naturalist, to which the contributing editors will be William C. Harris, Charles Hallock, Charles Barker Bradford, and J. Charles Davis. The articles will include sketches about all kinds of game-hunting; sketches about all kinds of game-shooting; sketches on

the hunter's camp; sketches on life in the woods; articles on guns, gunning, and ammunition; articles on game birds and animals; articles on game dogs; on the mountains and in the meadows; in the woods and on the waters; abroad in the fields and forests, and stories about rural nature in general; special articles by the leading sportsmen writers. The Nature Publishing Company, No. 10 Warren Street, New York, will publish the paper.

— *Outing* for November has for its leading article, "A Winter's Sport in Florida," by O. A. Mygatt. Other principal articles are "Whaling," by Herbert L. Aldrich; "Our Four-footed Friends," by "Borderer;" and "The Orange Athletic Club." Other articles are, "Lobsters and Lobster Pots;" "Crankslinger Skaddle Rides Back to his Youth," a cycling story by President Bates; "Squirrel-Hunting;" and the hunting story, "Over Rag Wheel Mountain."

— Charles Scribner's Sons published last week "The Viking Age," by Paul B. Du Chaillu. This work is the product of many years of incessant labor in the collection and arrangement of facts which throw light upon the character of the progenitors of the English-speaking race. Recent researches have made it clear that those Northmen who at the decadence of the Roman Empire overran and settled in Britain and the northern coast of Germany and France, were not barbarians, as has long been erroneously supposed, but a most highly civilized and accomplished people. Vast quantities of objects, including arms and armor, gold and silver ornaments of the most skilful workmanship and refined beauty, wood-carving, filigree work, agricultural and domestic implements, magnificent carriages, etc., have been unearthed. The work is in two octavo volumes, and contains 1,400 illustrations.

— The Reform Club, New York, has just issued a tariff dictionary, explaining the specific and ad valorem duties as imposed on every article under the present law, and as proposed by the Mills and Senate bills. It has been prepared by the tariff-reform committee of the club.

— G. P. Putnam's Sons have just ready Alfred Church's "To the Lions," a story of the persecution of the Christians under the early Roman Empire; and "The Story of Boston," by Arthur Gilman, in the series of Great Cities of the Republic.

— Gebbie & Co., Philadelphia, have just issued "Froudacity: West Indian Fables by James Anthony Froude," explained by J. L. Thomas, — a criticism of Mr. Froude's late book on the West Indies, written by a native in defence of his colored companions in the West Indies.

— J. G. Cupples Company announce a little book entitled "The Elixir of Life," being a compilation of what has been written concerning Dr. Brown-Sequard's discovery. It also contains Dr. Brown-Sequard's own account of his famous alleged remedy for debility and old age, Dr. Variot's experiments, and a sketch of Dr. Brown-Sequard's life, and a portrait.

— Longmans, Green, & Co. are about to issue an outline history of the development of modern music, showing the growth of opera, oratorio, and symphony, without digressing into mere biography of composers. It has been prepared by Mr. W. J. Henderson of the *New York Times*, and it will be called "The Story of Music."

— *Sun and Shade*, published by the Photo-Gravure Company, New York, has just concluded the first volume of a most successful year. Starting almost as an experiment, with a list of less than fifty subscribers, it has, by dint of its excellency, won for itself, as its publishers claim, a circulation of four thousand copies monthly. It is a novel undertaking, in that it is simply a picture periodical without letterpress excepting a table of contents. In the next volume will be presented reproductions of leading pictures in the Metropolitan Museum of Art; portraits of prominent leading men, first among which will be one of Mr. W. H. Appleton, the senior of the firm of D. Appleton & Co., to be followed by one of Henry George; and reproductions of the works of American artists, whether painters, sculptors, or architects. The reproductions, by whatever process, are all of the very best quality. The subscription price is four dollars per year.

— J. B. Lippincott Company have just ready a work entitled "Cycling," by R. P. Scott, which will be of interest to all who are fond of the exhilarating and healthful sport afforded by the bicycle,

tricycle, etc. The book contains a great deal of curious and useful information for wheelmen, and is illustrated by numerous engravings showing the development of the "wheel" itself.

— Judge S. M. Green, well known as the author of a number of legal works, embodied in an excellent treatise on crime, to appear shortly from the press of J. B. Lippincott Company, the opinions and settled convictions to which he has been led by a long experience as judge both in the circuit and supreme courts of Michigan. While the volume will naturally be of much service to lawyers, it is not specifically a legal book, but is a popular, and at the same time exhaustive, discussion of the nature, causes, treatment, and prevention of crime. The author looks on the criminal as diseased, and enables us to sympathize with him while we hate his crime, and, moreover, encourages us to bright hopes and strenuous effort for his cure.

— The Geological Survey of Pennsylvania has issued "A Dictionary of the Fossils of Pennsylvania and Neighboring States named in the Reports and Catalogues of the Survey," compiled by J. P. Lesley, State geologist. There are given three thousand figures of all the forms of animal and vegetable life hitherto seen in the geological formations of the State, both those collected by the assistant geologists of Professor H. D. Rogers, fifty years ago, and those collected since 1874.

— The "Bibliographical Catalogue of the Described Transformations of North American Lepidoptera," by Henry Edwards, issued by the Smithsonian Institution as Bulletin No. 35 of the National Museum, will supply a want that has long been felt by many entomologists, and will be acceptable to the students of the earlier stages of North American *Lepidoptera*. In its compilation, the author has occupied a good portion of the spare time at his command for three years past, and has carefully examined every publication that has been accessible to him.

— By permission of the Institution of Civil Engineers, the Scientific Publishing Company of this city publish the admirable paper of Sir Frederick Abel on "Mining Accidents," and the instructive discussion of it by the best-informed experts in Great Britain. This book summarizes the most advanced modern practice in coal-mining and the prevention of accidents; and it should be in the hands of every one interested in mining, as it is unquestionably the most valuable treatise on coal-mining in the language. In order to still further increase its value, the laws governing coal-mining in every State and Territory in the Union, and those of Great Britain and of the chief German mining districts, have been added to it.

— "A Preliminary Catalogue of the Shell-bearing Marine Mollusks and Brachiopods of the South-Eastern Coast of the United States," with illustrations of many of the species, by William Healey Dall, A.M., honorary curator, Department of Mollusks, United States National Museum, has just been issued by the Smithsonian Institution. This work is intended to assist students of the *Mollusca* in the United States by bringing together for their use a large number of excellent figures of species belonging to or illustrating the fauna of the southern and south-eastern coasts of the United States, from Cape Hatteras south to the Straits of Florida, and west to Mexico, with the adjacent waters. These figures are explained and connected by a catalogue of the mollusks known to inhabit that region, either from the presence of authenticated specimens in the National Museum or on the authority of reputable naturalists who have collected in the region, and whose specimens have been seen or reliably identified. This catalogue, arranged for convenience in tabular form, includes not only the species which are illustrated on the plates, but all other species common to the region, as far as known.

— J. E. Munson, Tribune Building, New York, has reprinted his important "Phonographic Phrase-Book," which has long been out of print.

— D. C. Heath & Co. will issue at once Hoffman's "Tales from History." Every student of German should read something of an historical nature, and the difficulty lies in finding something brief enough for class use. These tales are short, and independent of each other, and yet complete enough to insure sustained interest. The notes are both historical and explanatory. This firm will also

issue at the same time Freytag's "Aus dem Staat Friederichs des Grossen," with notes explanatory and critical, by Herman Hager. In this sketch we have not a detailed account of the facts of Frederick's life, but the author directs his attention mainly to the working of the hero's mind, to the gradual building-up of that character which came to be the moulding force of Germany. An appendix adds some notes on the phonetic changes in German, and special attention is given to awaken an interest in the gradual development of the meaning in words.

— Macmillan & Co. have just ready "Select Essays of Dr. Johnson," edited by George B. Hill, in the Temple Library; a selection of the best essays of De Quincey, edited by W. H. Bennett, in the Stott Library; and a new library edition of Wordsworth, in eight octavo volumes.

— From the *Publishers' Weekly's* "Notes on Authors," we learn the following: Friedrich Spielhagen is reported to be writing his autobiography. It is to be issued in instalments in a new German magazine. Miss Kate Field, the author and lecturer, contemplates starting a journal. Gustav Freytag, the novelist, will shortly publish a little work on the late Emperor Frederick, taken from his notes during the war, and his letters from the camp down to the election of the German Emperor. Horatio Seymour of Marquette, Mich., who was formerly State engineer of New York, is preparing for publication the correspondence of Gov. Horatio Seymour, and desires to secure copies of letters not already in his possession.

— In spite of the rapid increase in the number of millionnaires in the United States in recent years, the popular notion is that wealth is yet very much more evenly distributed in this country than in England. Mr. Thomas G. Shearman, the well-known New York statistician, has been engaged for some time in collecting facts to show as precisely as possible the proportion of the wealth of the country held by a few rich men and families; and he finds a greater concentration of wealth here than in any other country. The results of his investigation will appear in *The Forum* for November, from advance sheets of which the following facts are taken. Mr. Shearman makes the following enumeration of owners of more than \$20,000,000 each: \$150,000,000, J. J. Astor, Trinity Church; \$100,000,000, C. Vanderbilt, W. K. Vanderbilt, Jay Gould, Leland Stanford, J. D. Rockefeller; \$70,000,000, estate of A. Packer; \$60,000,000, John I. Blair, estate of Charles Crocker; \$50,000,000, William Astor, W. W. Astor, Russell Sage, E. A. Stevens, estate of Moses Taylor, estate of Brown & Ives; \$40,000,000, P. D. Armour, F. L. Ames, William Rockefeller, H. M. Flagler, Powers & Weightman, estate of P. Golet; \$35,000,000, C. P. Huntington, D. O. Mills, estates of T. A. Scott, J. W. Garrett; \$30,000,000, G. B. Roberts, Charles Pratt, Ross Winans, E. B. Coxe, Claus Spreckels, A. Belmont, R. J. Livingston, Fried Weyerhauser, Mrs. Mark Hopkins, Mrs. Hetty Green, estates of S. V. Harkness, R. W. Coleman, I. M. Singer; \$25,000,000, A. J. Drexel, J. S. Morgan, J. P. Morgan, Marshall Field, David Dows, J. G. Fair, E. T. Gerry, estates of Gov. Fairbanks, A. T. Stewart, A. Schermerhorn; \$22,500,000, O. H. Payne, estates of F. A. Drexel, I. V. Williamson, W. F. Weld; \$20,000,000, F. W. Vanderbilt, Theo. Havemeyer, H. O. Havemeyer, W. G. Warden, W. P. Thompson, Mrs. Schenley, J. B. Haggin, H. A. Hutchins, estates of W. Sloane, E. S. Higgins, C. Tower, William Thaw, Dr. Hostetter, William Sharon, Peter Donohue. These 70 names represent an aggregate wealth of \$2,700,000,000, an average of more than \$37,500,000 each. Although Mr. Shearman, in making this estimate, did not look for less than twenty-millionnaires, he discovered incidentally fifty others worth more than \$10,000,000 each; and he says that a list of ten persons can be made whose wealth averages \$100,000,000 each, and another list of one hundred persons whose wealth averages \$25,000,000. No such lists can be made up in any other country. "The richest dukes of England," he says, "fall below the average wealth of a dozen American citizens; while the greatest bankers, merchants, and railway magnates of England cannot compare in wealth with many Americans." The average annual income of the richest hundred Englishmen is about \$450,000; but the average annual income of the richest hundred Americans cannot be less than \$1,200,000, and probably exceeds \$1,500,000. The richest of the Rothschilds, and the world-re-

nowned banker, Baron Overstone, each left about \$17,000,000. Earl Dudley, the owner of the richest iron-mines, left \$20,000,000. The Duke of Buccleuch (and the Duke of Buccleuch carries half of Scotland in his pocket) left about \$30,000,000. The Marquis of Bute was worth, in 1872, about \$28,000,000 in land; and he may now be worth \$40,000,000 in all. The Duke of Norfolk may be worth \$40,000,000, and the Duke of Westminster perhaps \$50,000,000. Mr. Shearman's conclusion is that 25,000 persons own one-half the wealth of the United States; and that the whole wealth of country is practically owned by 250,000 persons, or one in sixty of the adult male population; and he predicts, from the rapid recent concentration of wealth, that under present conditions 50,000 persons will practically own all the wealth of the country in thirty years, or less than one in 500 of the adult male population.

— Col. H. G. Prout, in the November *Scribner*, gives the following pen-picture of Emin Pacha, whom he knew about thirteen years ago: "In person Emin is a slender man, of medium height and tough and wiry figure. He is swarthy, with black eyes and hair. His face is that of a studious professional man, and that impression is heightened by the glasses he always wears. His attitudes and movements are, however, very alert. He stands erect and with his heels together, as if he had been trained as a soldier. He was always reticent about himself, and his history was known to no one in the Soudan or the provinces of the equator. He was supposed to be a Mohammedan. I am not sure that he ever said that he was, but I am quite sure that he did not deny it when I knew him. It has become known later that he is German, of university education; but there were many at that time who thought he was a Turk of extraordinary acquirements. He is certainly a man of great abilities in many ways, and of strong character." There is a circle in Paris which pays weekly visits to the studio of a young Russian artist, Marie Bashkirtseff, who died five years ago. This ambitious and gifted young woman left a remarkable journal, which has been published in France, and has attracted many readers because of the frankness with which she here draws the complete story of her life, her ambition, her suffering, and her love. The book has many of the qualities which made Amiel's journal famous. Miss Josephine Lazarus, a sister of the poet, Emma Lazarus, will summarize this notable book in the same number of *Scribner*. William Henry Bishop, author of "The House of the Merchant Prince," who has been living abroad for the past year, has written, also for this number, a picturesque description of the old Spanish university of Salamanca, giving a clear idea of modern Spanish student life.

— In *Lippincott's Monthly Magazine* for November, Edward Heron-Allen contributes an article on "The Violin," which gives much information concerning that instrument. The poet-critic R. H. Stoddard continues his series of papers upon American authors by contributing a sketch of William Cullen Bryant. William S. Walsh has an article upon "Handwriting and Writers," in which he dilates upon the chirography of many famous people. Some funny stories are told of Horace Greeley, arising from the well-known illegibility of his handwriting. In "Does College-Training Pay?" D. R. McAnally severely arraigns the methods of instruction in our colleges, and hurls some hard facts at the dons, which it is to be hoped they will take cognizance of. "The Question of Pure Water for Cities" is an article contributed by William C. Conant, editor of *The Sanitary Era*. It contains suggestions for rendering water pure and drinkable, — suggestions that should be acted upon by the authorities in every large city. Melville Phillips, one of the editors of the *Philadelphia Press*, tells what it costs to issue big newspapers.

— "The Lost Inca," by the Inca Pancho-Ozollo, is one of Cassell's Sunshine Series of original novels. In this story, the scene of which is laid in Peru, the *dramatis personæ* mainly consist of a party of North American engineers and a newly discovered people in the valley of the Inti-Mayu. This party become suddenly and without preparation residents of the valley, and find there much cultivation and refinement, and themselves add many modern scientific appliances to an already advanced civilization. It is an historical fact that an Inca disappeared from history. The Spaniards declared that he was killed in an engagement: there is no proof of it. The bodies of the Spanish soldiers were found, but

none of the Indians; and it is still believed in Peru, among *las barbaras* in the upper Amazonas, that the descendants of this Inca still live. The author has found the Lost Inca: the Last Inca is not yet.

— Col. H. G. Prout (Baroud Bey), in his article on Emin's province in the November *Scribner*, says, "Emin's uncertain power in a savage land is all that remains of the late Khedive's Central African Empire. One day, in Khartoum, Gordon asked me what I thought would be the future of the Equatorial Provinces. I said, 'The power will gradually return to the Arabs, the negroes will kill their friends and tormentors together, and the good old times of war and famine will come back.' I am still of that opinion. Unless the enlightenment of Europe can control the upper Nile country, either through the Soudan or from the south, barbarism will control it. By control I mean physical control, and that must be directed by some one better than the Turk, the Arab, or the Circassian." Dr. James E. Pilcher, captain Medical Department, U.S.A., will describe in the same number the organization and appliances of the modern Sanitary Corps, which aims to relieve and care for the sick and wounded in the time of battle and in peace. The abundant illustrations of this article have been made from photographs of the corps actually at practice-work, and show very clearly the methods, which are of equal interest to all those who are members of the many societies for First Aid to the Injured, and the National Guard, which has adopted this system. In view of the congress of representatives of maritime nations in Washington, Professor J. Russell Soley's article will be of especial interest. He shows how certain principles of international law (which Great Britain has mainly been instrumental in establishing) will re-act to the disadvantage, and even great peril, of that nation in the event of another Anglo-continental war. He also discusses the effect which our navigation laws will have in preventing us to profit from the redistribution of the carrying trade which would ensue. Goethe's house at Weimar, from which the public have been excluded rigidly until within a year, will be fully described by Oscar Browning. The many illustrations are from the first photographs taken since the house was thrown open, and represent the rooms as Goethe left them. Dr. M. Allen Starr will describe the effects of electricity upon the human body. This subject is of special importance, owing to the frequent reports of accidents due to contact with electric wires, to the recent adoption of electricity as a means for executing criminals, and to the extravagant claims of the curative powers of electricity in diseases. Dr. Starr will draw the line very sharply between the legitimate use of electricity and quackery.

— The November issue of *The Chautauquan* presents the following table of contents: "The Burial of Rome," by Rodolfo Lanciani, LL.D.; "The Politics which made and unmade Rome," by President C. K. Adams, LL.D.; "The Life of the Romans," by Principal James Donaldson, LL.D.; "The Story of Sejanus," by George Parsons Lathrop; "Map Quiz" on *The Chautauquan* Map Series; "The Cause of Geographic Conditions," by Professor N. S. Shaler; "Mental Philosophy," by John Habberton; "The Uses of Mathematics," by Professor A. S. Hardy, Ph.D.; "Traits of Human Nature," by the Rev. J. M. Buckley, D.D.; "What shall the State do for me?" by Thomas B. Preston; "English Politics and Society," by J. Ranken Towse; "The Story of No Man's Land," by John R. Spears; "Maria Mitchell," by Harriet Prescott Spofford; "The French Constitution," by Albert Shaw, Ph.D.; "Electricity at the Paris Exposition," by Eugene-Melchior de Vogue; "In Armenian Villages," by Harriet G. Powers; "The Modern Thermometer," by Ernest Ingersoll.

— D. C. Heath & Co. will publish this month Lessing's "Minne von Barnhelm," a comedy in five acts, edited with notes and an extended introduction by Sylvester Primer. The play is highly interesting, since the style is Lessing's best, and the dramatic effects well sustained. The study of Lessing as a dramatist and a critic is essential to a comprehensive knowledge of Germany's great classic period: hence the importance of this masterpiece to students of German. In the introduction the editor gives the progress of German literature from the time of Opitz to Lessing, the condition of the German stage, and something of the intellectual development of the people during this period. A discriminating biogra-

phy of Lessing and a "critical analysis" of the play give a full analysis of the characters and an account of the historical and other sources, while its national importance as being truly German is well brought out.

INDUSTRIAL NOTES.

The Bower-Barff Rustless Iron Process.

ABOUT eighteen months ago, Mr. Henry M. Howe, the eminent metallurgist whose work on steel is now being published in *The Engineering and Mining Journal*, applied to several of the licensees of the Bower-Barff Rustless Iron Company for samples of cast and wrought iron which had been treated by the processes controlled by this company, for the purpose of testing their resistance to oxidation. Mr. Howe, who is now in Paris acting as United States iron and steel commissioner at the exposition, writes to the company as follows in relation to these experiments:—

"I have just summed up the results of my experiments in the matter of protective coatings for iron. I enclose table of results, which you may use if you want, and as you want. The Bower-Barff wins easily, beating even tinned and galvanized badly. The galvanizing was done by the Rhode Island Tool Company, whose work, I understand, is of the very highest; and they were informed that the work was for a test trial. The conditions were rigidly

Loss of Weight of Wrought and Cast Iron with Different Protective Coatings and under Different Conditions, in Pounds per Square Foot of Surface per Annum.

Sheet Iron (No. 23 Gauge, Black).

Protective Coatings.	Exposed to the Weather Inland.		Immersed in	
	Canada.	New York State.	Fresh Water.	Sewage.
Bower-Barffed...	.0	Gain .000.3	.006.7	.003.6
Tinned... ..	Gain .002.0	.000.1	.019.4	.007.1
Nickel-plated...	.0	.000.5	.050.4	.003.1
Galvanized.....	Gain .000.4		.045.9	.080.5
Barffed.....	.001.0	.003.1	.083.9	.117.0
Black; i.e., unprotected....	.001.3	.022.6	.137.0	.169.0
Copper-plated...	.000.2	.005.0	.179.0	.182.0

Cast Iron.

Protective Coatings.	Exposed to the Weather Inland.		Immersed in	
	Canada.	New York State.	Fresh Water.	Sewage.
Bower-Barffed...	Gain .004.0	Gain .003.1	Gain .005.5	.001.4
Bower-Barffed and paraffined	.000.6	.001.9	.000.2	.008.4
Galvanized.....	.0	.0	.049.1	.061.0
Tinned.....		Gain .003.1	.065.5	.061.0
Nickel-plated..	Gain .003.4	.002.5	.136.7	.083.3
Copper-plated...	" .004.0	.005.0	.150.8	.119.2
Black; i.e., unprotected...	" .006.3	.012.0	.148.3	.272.4

identical. It is a fair victory. I shall publish the results as an appendix to my "Metallurgy of Steel," and perhaps more fully thereafter. Immersed in Chestnut Hill Reservoir, Boston, for a year, the Bower-Barffed wrought-iron plate was hardly discolored, except where held by the crate. Another immersed in the Boston main-sewer sewage for a year retained its skin, and was only slightly pitted, while most of the tin was removed from a tinned iron sheet beside it. If you publish these, credit R. W. Lodge with doing the work with me. He put in a good deal of hard work and deserves credit."